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AGRICULTURE;

BEING A CONTINUATION, ON AN ENLARGED PLAN,

OF THE

Repertory of Arts & Manufactures,

A WORK ORIGINALLY UNDERTAKEN IN THE YEAR 1794, AND STILL CARRIED ON WITH A VIEW TO COLLECT, RECORD, AND BRING INTO PUBLIC NOTICE, THE USEFUL INVENTIONS OF ALL NATIONS,

NEW SERIES.—VOL. VI.
July—December, 1836.

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INDEX

TO

VOL. VI. NEW SERIES.

Fig 1

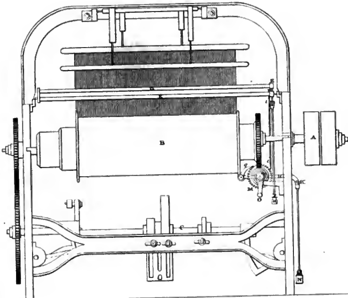
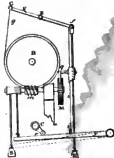


Fig 4



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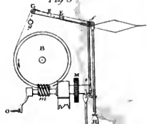
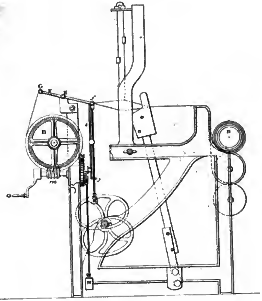


Fig 2



F Mansell sc

London Hodson 112 Fleet Street July 1826

THE

REPERTORY

OF

PATENT INVENTIONS.

No. XXXI. NEW SERIES.—JULY, 1836.

Specification of the Patent granted to Apelles Howard, *of Stockport, in the county of Chester, Cotton Spinner, and* John Scattergood, *of Manchester, in the county of Lancaster, Machine Maker, for certain Improvements in Looms for Weaving whether worked by Hand or by Power.*—Sealed October 5, 1835.

WITH AN ENGRAVING.

To all to whom these presents shall come, &c. &c.,—*Now know ye*, that, in compliance with the said proviso, We, the said Apelles Howard and John Scattergood, do hereby declare that the nature of our invention of "improvements in looms for weaving, whether worked by hand or by power," consists in the arrangement and application of certain additional parts or apparatus to an ordinary loom, whether worked by hand or by power, by which the amount of tension on the threads or ends of the warp is regulated, and the motion of the warp beam governed or caused to correspond with the uniform take up motion of the cloth beam, on which the fabric in the process of weaving is placed. To make the nature of our invention better understood, we have hereto annexed a drawing of one description of power loom with our improvements applied to it. The scale to which this

drawing is made is marked thereon, and the same letters of reference which are used in describing the drawing indicate the same parts in the various figures which are numbered figure 1, figure 2, and figure 3, and we consider that after we have described the nature of our invention as applied to the loom represented in the annexed drawing, it will be obvious to persons conversant with looms that the same improvements may be applied to looms, of any build or description with a slight variation in the arrangement and application of such parts as constitute our invention. We shall now proceed to describe the manner in which our invention is to be carried into effect in reference to the annexed drawings.

Description of the Drawings.

Fig. 1, is a back view of a power loom.

Fig. 2, a side view in which part of the framing is removed for the purpose of making the application of our improvements more obvious, and,

Fig. 3, a view of our improvements apart from the loom for the purpose of shewing more clearly the nature and construction of the same. In figs. 1 and 2, some of the ordinary parts of the loom are omitted, and only such parts delineated as we consider requisite to explain and shew the position in which our improvements are applied. In these figures, A, represents the driving pulley key on the crank shaft, which gives motion to the lay or slay; B, the warp beam; D, the cloth beam; and C, the tappit shaft by which the position of the heddles is regulated, thereby producing the shed or opening in the warp for the passage of the shuttle at each vibration of the lay or slay. The remaining parts of the loom (with the exception of such parts in which our improvements consist) are common to all looms of this description, and not being of our invention require no further explanation. In figures 1 and 2, E, represents a shaft supported at each extremity in the framing of the loom parallel to, and immediately

above the warp beam; and F, F, are small arms or levers proceeding from and firmly attached to the shaft, E. At the extremity of the arms or levers, F, F, is placed a similar shaft, G, and the course of the warp threads from the warp beam, B, will be seen in figures 2 and 3, proceeding above or over the shaft, G, and under the shaft, E. The shaft, E, moves freely on its axis, and (in the opposite direction to the levers, F, F) a small lever, *f*, proceeds, at the extremity of which is suspended the weight, H, as best seen at figures 2 and 3. This lever, *f*, also carries a perpendicular rod, *i*, *i*, which moves freely through an opening or hole in the lever, *k*, beneath. L, represents a worm-wheel firmly attached to the shaft on which the warp beam, B, is placed, and *m*, a worm or screw taking into the wheel, L. On the same shaft which carries the worm or screw, *m*, is placed or keyed the ratched wheel, M, and also the vibrating lever, K, which is not keyed but perfectly free. The lever, K, is provided with a catch or dog, *q*, taking into the ratchet wheel, M, and at the other extremity with a rod suspending the counter weight, N, as seen in the drawing. Now by retracing the action of the various parts which we have last described, and which, to make the description more clear, are tinted red in the drawing, it will be obvious that any amount of warp can be given off by revolving the warp beam, B, by means of the worm, *m*, in one direction, while it will be taken up, or the reverse will be produced, by the opposite motion of the worm, *m*, and further that the position of the shaft, G, will vary or vibrate according as the warp is taken up, or given off by the warp beam, B. Therefore supposing the warp to be wound up to a given point, by means of the small handle, *o*, the shaft, G, will assume a certain position, and the amount of tension to which the warp is subjected will (as represented in the drawing) depend on the amount of counter weight, H, placed at the extremity of the lever, *f*, which has a constant tendency to elevate the

shaft, G, as best shewn at figures 2 and 3. Under these circumstances, as soon as the loom is put into action, and the regular vibration of the lay or slay proceeds, the cloth which is produced will be taken up on the cloth beam, D, and consequently the warp which passes over the shaft, G, will have a tendency to depress that shaft, although the tension of the warp will not materially vary on account of the counter weight, H, remaining always the same. But as soon as the take up of the cloth-beam has proceeded so far as to depress the shaft, G, to the position indicated in dotted lines at, *g*, the rod, *i*, *i*, elevates the lever, K, and thereby gathers a tooth in the ratchet, M, by means of the small catch or dog, *q*, which, on the return of the lay or slay, is carried forward by the counter weight, N, and actuates the warp beam, B, which gives off the amount of warp which was required. This train of movement in which our improvement consists is shewn separate at figure 3, and the motion of the various parts is indicated by dotted lines, by which, together with the foregoing description, it will be obvious that the regular take up of the cloth on the beam, D, as it is produced, is provided for by a commensurate giving off of warp from the beam, B, caused by the depression or varied position of the shaft, G, as already explained. In weaving cloth of a finer quality we have found the arrangement represented at figure 4, to act rather more uniformly than that already described. In this figure the arrangement of parts does not vary from the former arrangement already described, excepting that in the place of the weight, N, and vibrating lever, K, we apply a catch or dog, *q*, placed on a stationary fulcrum as seen at (*x*) and the rod, *i*, *i*, is carried downwards and attached by a small spring to the lever, *y*, which moves freely on a fixed fulcrum, at (Z). This lever (*y*) is placed under the tappit shaft (C), and when a sufficient quantity of yarn is given off from the beam, B, the small wiper (*r*) does not interfere with it, but as soon as the rod, G,

is depressed by the tightening of the warp, as already described, the (*y*) lever is raised and comes in contact with wiper (*r*), which immediately depresses it, and rotates the ratchet wheel, M, by means of the band and tighting weight (s), with which it is connected; this band being passed round the small drum or barrel placed on the same shaft as supports the ratchet (M). But the whole of this is merely a modification of the arrangement already described, by which our invention, in some cases, is more easily applied, and we think acts more uniformly in weaving cloth of a finer quality. And although we have introduced several well known parts of the ordinary loom, for the purpose of shewing the position and manner in which our improvements are applied, we do not claim any of such well known parts; but we do claim the arrangement and adaptation of the vibrating shafts, G and E, with the apparatus connected therewith, by means of which we are enabled to govern the tension of the warp and regulate the giving off from the warp-beam according to the take up of the beam on which the cloth is received in the process of weaving. It is also that the giving off motion may be connected with the take up of the cloth-beam, so that the giving off and the taking up may act uniformly and accurately together.—In witness whereof, &c.

Enrolled April 6, 1836.

Specification of the Patent granted to JAMES WALTON, *of Sowerby Bridge, in the Parish of Halifax, in the County of York, Frizer, for certain Improvements in Machinery for Dressing, Finishing, and Setting the Face on Woollen or other Cloths requiring such process.*—Sealed October 23, 1835.

WITH AN ENGRAVING.

To all to whom these presents shall come, &c. &c.—

Now know ye, that in compliance with the said proviso, I, the said James Walton, do hereby declare the nature of my invention, and the manner in which the same is to be performed, are fully described and ascertained in and by the following statement thereof, reference being had to the drawing hereunto annexed, and to the figures and letters marked thereon, (that is to say) :

My invention of certain improvements for dressing, finishing, and setting the face on woollen or other cloths requiring such process, consists, first, in giving an eccentric motion to the bed or surface over and on which the woollen or other cloth is passing, in that part of the process of dressing and finishing cloths called cropping, shearing, or cutting off the nap; secondly, in giving an eccentric or other constant motion to one plain or level surface or portion of a machine for pressing woollen or other cloths, by which means the cloth is laid even and is smoothly pressed as it passes through the machine, whereby the processes of dressing, finishing, and setting the face on woollen and other cloths will be facilitated and improved, as will be described hereafter.

Description of the Drawing.

Plate 1, which represents various views of a shearing machine, having the first part of my improvements applied thereto. In each of the figures of this drawing the same letters and figures of reference indicate similar parts wherever they occur.

Fig. 1, is an end view.

Fig. 2, a front view.

Fig. 3, is a transverse section.

Fig. 4, is a longitudinal section of the bed or surface on which the cloth is cut, and to which an eccentric motion is communicated, as hereafter described, whereby the cloth (in being cut or sheared) partaking of the motion given to the bed, each part of the surface of the cloth is constantly brought back to different parts of the shearing

apparatus in place of being carried constantly forward and away from the shearing-apparatus immediately each particular part of the surface has been once operated on by the rotatory cutters.

Fig. 5, is a transverse section of the bed and the shears or rotatory spiral cutters together with the fixed blade against which the rotatory cutters act.

Fig. 6, is an end view of the same parts as fig. 5.

Fig. 7, is a plan of the bed, which consists of a quadrangular frame having the upper surface covered with plush, or other suitable material, stretched evenly over it, as is clearly shewn in the drawing; and by this figure and fig. 4, the manner of giving the desired motion to the bed will readily be traced, more particularly when the various parts of machinery are more fully explained, as will be the case hereafter.

Fig. 8, shews a plan of the rotatory cutters and parts connected therewith, which, however are similar to those in ordinary use, and will consequently require but little more explanation. *a*, *a*, is the framing of the machine. *b*, *b*, fixed and loose pulley affixed on the main shaft, *c*, which main shaft turns in suitable bearings at each end of the machine. *d*, is a pulley on the main shaft, which, by means of a strap or gut-band communicates motion to the pulley affixed on the axis of the rotatory cutters or shears. *e*, *e*, are pulleys (on the shaft, *c*) which by means of straps or gut-bands drive the pulleys on the axes of the drawing and setting-up rollers. *f*, is the roller for setting up the pile or nap on the face of the cloth previous to the cloth coming to the shears; this roller, *f*, is covered with cards, or has metal edges, or other well-known means of performing the setting up of the pile or nap. *g*, is a cog-wheel for driving the drawing-rollers, *h*. *i*, cutting-cylinder with spiral blades. *j*, ledger-blade. *k*, frame in which the cutting-parts are fixed. *l*, pillars for the same. *m*, connecting-rods. *n*, cranks. *o*, strong shaft to which the cranks are fixed. *p*, lever for lifting the cutting part.

q, an adjusting-screw or stop, to regulate the distance between the ledger-blade and bed. *s*, stop to hold the cutting-part of the bed at the time the piece of cloth is being put into the machine. *t*, roller on which the piece is lapped before cutting. The tension of the cloth is regulated by a friction cord and weight, as is well understood, though not shown in the drawing. *u*, *u*, toothed-wheels fixed on the main shaft. *v*, *v*, are pinions keyed on the spindles, *w*, *w*; and *x*, *x*, are eccentrics which are fixed on the spindles, *w*, so that both ends of the bed will describe the same movement, and exactly together. *y*, are metallic brushes bored true to receive the eccentrics, and fixed to the bed. *z*, the bed, which is a strong, light frame of wood, with a cover of plush or some other fabric tightly braced or extended by the screws, *s* (see figure 5). 2, plush. 3, 3, rods by which the bed is suspended to the top of the frame, *a*, *a*, and by which the bed is permitted to be moved by the eccentrics, as above described, and by the screws and nuts any required degree of pressure may be obtained, as will be readily understood on examining the drawing. 4, spring to allow of the vibration of the rods. 5, small roller covered with fillets of cards fixed spirally from the centre outwards to the back of the bed to pull the lists of the piece up when slack, and prevent the cutters from catching. 6, pulley and lever for regulating the tension of the cord that turns the spiral cutters or shears. The red lines shew the lists of the cloth, and the arrows point in the direction it moves.

I will now proceed to describe the second part of my invention which are represented in drawing, in plate **2**.

Fig. 1, is an end view.

Fig. 2, a plan.

Fig. 3, a transverse section taken through some of the parts of the machine, in order to shew the relative positions of such parts; their object and action will be more fully described hereafter.

Walton's Patent

Plate 1

Fig 1

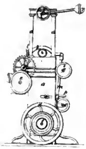


Fig 3

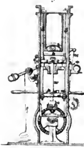


Fig 2

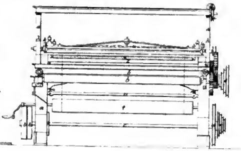


Fig 5

Fig 6

Fig 8

Plate 2

Fig 7

Fig 3

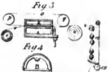


Fig 7

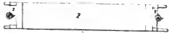


Fig 4

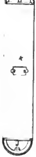


Fig 5

Fig 4

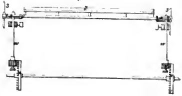


Fig 6

Fig 8

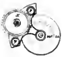


Fig 1

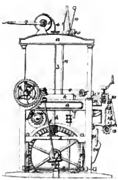


Fig 2

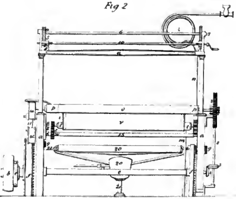


Fig. 4, represents the upper and moveable pressing and heated surface.

Fig. 5, the bed or lower heated and fixed surface; between these surfaces the cloth is constantly drawn forward and the surface thereof evenly laid and pressed, and it should be stated that the under surface, fig. 5, is covered with plush which is stretched evenly over its surface, such plush being joined at the point, C, D, with the nap or face thereof running outwards, as is indicated by the arrows; by this means, the cloth in being drawn over its surface when the same is being pressed on by the upper surface (of fig. 4), the effect produced will be that the cloth will be stretched in its width. It should be remarked that the cloth could not be safely drawn through or between the two surfaces of the machine when they press closely together, if it were not for the motion which is communicated to one of the surfaces; by this means the cloth will be found to pass freely between these two plain surfaces, notwithstanding very considerable pressure is used.

Figs. 6, 7, and 8, represent detached parts of the machine shewn separately. *a, a,* framing. *b,* the driving pulley. *c,* sliding clutch for starting and stopping the machine. *d,* a lever for working clutch, as is well understood. *e,* main shaft. *f, f,* are toothed wheels. *g,* pinions driven by the wheels, *f.* *h,* upright spindles cranked at the top (as shewn separately and on a larger scale in figure 7). *i,* strong metallic table or steam chamber planed on the face and firmly fixed to the frame, *a.* Into this chamber, *i,* steam is permitted to flow to heat the surface. *k,* light metallic steam-chamber, planed evenly on the face, and ground to the table, *i,* so that the faces may exactly correspond. *l,* brass or other bushes fitted in the chamber and bored to correspond with the cranks on the top of the spindles, *h,* which revolve at a quick speed (say four hundred revolutions per minute). *m,* steam-pipe for supplying the lower or fixed chamber

with steam. *n*, steam-pipe (for heating the upper or moveable chamber), which pipe, *n*, is curled up to prevent the motion of the steam-chamber, *k*, from breaking the joints, the extent of piping allowing sufficient play for that motion. *o*, endless cloth, which is extended over the roller, *p* and *q*, and kept tight by the screws, *r*. This endless cloth assists in drawing the piece of cloth which is to be passed through the machine. *s*, gear and shaft for driving the endless cloth. *t*, roller for lapping the cloth on, which is turned with a strap on the pulleys, *u*, *u*, which strap is allowed to slip as the diameter of the cloth roller increases. *v*, piece of cloth shewn passing through the machine. The working of the lapping roller will be better understood by referring to figure 8, which is on an enlarged scale, where, *w*, is a strong wheel on the same spindle as the pulley, *u*, and working in a boss fixed to the frame. *x*, wheel working in *w*, and fixed on a short spindle which fits any of the bosses, *y*. In the end of the spindle, *x*, is a hole to receive the arbor of the lapping roller and two studs on the face of the wheel to take in a cross on the end of the roller. *z*, a bridge-tree which slides in grooves in the sides of the frame to raise or lower the spindles to make the moveable surface or chamber, *k*, describe a greater or less circle. 1, 1, screws for lifting bridge-tree. 2, shaft with two worms which work in wheels in the screws. 3, suspension-rods to support the surface, *k*. 4, chains on the top of the rods 3, and fixed to the pulleys 5, 5. 6, shaft on which the pulleys are fixed. 7, lever to lift the surface, *k*, off the piece of cloth when the machine is standing. 8, stands screwed in the inside to fit the male screw, *q*, on which is a wheel. The screw, 9, is bored through the centre to admit of the suspension rod sliding freely through. 10, shaft on which is fixed two worms which take into the wheels, 9, 9. On the top of the suspension rods are collars which rest on the tops of the adjusting screws, 9, 9, and support the surface,

k, at any required distance from the table when it is not requisite to lay its whole weight on the cloth. It will now be evident that by turning the shaft, 10, both the adjusting screws will move together, by which the pressure may be regulated to the greatest nicety. 11, cylindrical brush to lay the pile or nap of the cloth straight and even before going through the press. 12, roller which works in the slide 13, by the screw 14, to give the cloth the requisite lap on the brush. 15, 15, fixed rails. 16, 16, rails fixed in the frame, 17, which moves on a centre at 18, by the rack and pinion, 19, to regulate the tension of the cloth. 20, steam-pipe pierced full of small holes on the top, to damp the cloth when dry, similar to the steaming apparatus in use in brushing machines. 21, stays for fixing the steam-pipe to the framing.

Having thus described the nature of my invention, and the manner of carrying the same into effect, I would remark that I do not claim any of the parts of the machines separately or combined as herein shewn and described (other than as herein particularly pointed out as my improvements), they being for the most part well known and in use; nor do I confine myself to the precise arrangements thereof, though they are the best machines I am acquainted with for receiving the application of my improvements.

I would also remark that I am aware that the motion which is described as being applied to the bed of the shearing machine, and the motion as applied to the surface *k*, of the pressing machine, is similar to that used in frizing machinery; I do not therefore make any claim thereto as being my invention, but only claim the application of such motions to, and combining it with, machinery for shearing and pressing cloth as herein described.

And I would have it understood, that it is not essentially necessary that the endless cloth, *o*, should in all

cases be applied to the pressing machine, as in some instances the heated surface of the metal may come directly in contact with the surface of the cloth when being pressed, or when the nap and surface is being smoothed and laid. And further it is not absolutely necessary that the two surfaces, *i*, *k*, should be both heated as herein described, as a very advantageous result will be obtained by only heating one surface, and it is not essential that the movement should be applied only to the upper surface, *k*, as a similar effect would be obtained if the under surface, *i*, were caused to move in like manner to that described for the surface, *k*, though there would be no additional advantage thereby obtained over one surface moving.

But I would have it understood that what I claim as my invention is,

First, the applying of an eccentric motion to the beds of shearing machines, whereby the cloth which is being cropped, partaking of the motion of the bed, is brought back to the cutting edges, and thus ensuring greater correctness of cutting, cropping, or shearing as above described.

Secondly, I claim the giving motion to one of two plain surfaces, whereby the cloth, although pressed between them, will, by such motion, be permitted to be constantly drawn forward, and whereby the same will be pressed and laid even, and thus materially improving and facilitating the processes of dressing, finishing, and setting the face on woollen or other cloths as above described.—In witness whereof, &c.

Enrolled April 23, 1836.

Specification of the Patent granted to Joseph Egg, *of Piccadilly, in the County of Middlesex, Gun Maker, for Improvements on certain descriptions of Fire Arms.* —Sealed May 2, 1835.

WITH AN ENGRAVING.

To all to whom these presents shall come, &c. &c.,— *Now know ye*, that in compliance with the said proviso, I, the said Joseph Egg, do hereby declare that my improvements on fire-arms consist in applying peculiarly constructed priming magazines to be attached on the barrel of fowling-pieces, pistols, and such like fire-arms, and in the mode of conducting the detonating-tube or primer from the magazines to the pan, cup, or touch-hole, for the purpose of priming the piece, and also in a mode of cutting off the communication between the touch-hole and priming chamber or magazine, at the time the piece is discharged.

Description of the Drawing.

Fig. 1, is a view of the lock and breech part of a gun upon this improved principle, the parts standing as at half-cock.

Fig. 2, a view of the same after the piece is discharged, or the cock at bearing.

Fig. 3, the inside view of the lock detached, the parts in the position of fig. 1.

Fig. 4, is also a view of the inside of the lock detached, the parts in the position of fig. 2.

Fig. 5, an horizontal view of a double barrel, showing the recess between the barrels before the magazine is attached.

Fig. 7, the magazine detached, which consists of two tubes, when for a double, of any length preferred, fastened to a top piece, and which, for this construction of lock,

must be filled with short tubes containing detonating composition, and then deposited in the recess, *a*, and there secured by a screw or other suitable contrivance. On raising the muzzle of the piece the priming descends to the broad part of the chamber, *b*, and there passes through a small passage or passages, *c*, *c*, in a lateral direction; the outer part of this passage is closed by a slide or conductor, shewn at figs. 3 and 4. But when the cock is raised, as at fig. 1, an aperture, *z*, comes opposite this passage, *c*, and permits the priming to descend through it to the slide or conductor, and which empties itself into the pan or touch-hole. The head of the slide or conductor has a small protuberance, as shewn at figs. 1 and 8, which serves as a cap or cover to the pan or touch-hole, and which passes the magazine, as shown at fig. 1; and in pulling the triger, the tumbler brings down the lever, *f*, which, by its connection with the arm of the slide or conductor, *d*, seen at figs. 3 and 4, covers the communication, as at fig. 3, to the position of fig. 4, and by that means cuts off the communication between the priming-chamber and the cup or touch-hole.

It will be evident, from the above description, that a similar priming-magazine and chamber may be applied to fire-arms intended to be primed with gunpowder, but in that case it will be necessary to enlarge the passage leading from the chamber to the pan or touch-hole, and a different constructed lock must be employed, with a flint, cock, and hammer; I do not, however, claim any novelty in the lock or any other part of the piece, except in those parts which are marked with letters upon the drawings and referred to as above: in short, my improvements in the construction of guns and fire-arms, are upon the self-priming detonating principle, are confined to the construction of a priming-chamber or magazine attached to the barrel or barrels of fire-arms, as above described, though the same may be varied to suit other forms, place, or position, contiguous to the breech, false-breech, or

barrel, and in the necessary shield, slide, guide, or conductor, which also may be varied in shape or position for the purpose of admitting the priming to the touch-hole when the piece is loaded, and of cutting off the communication between the chamber and the touch-hole, when the piece is discharging.—In witness whereof, &c.

Enrolled November 9, 1835.

Specification of the Patent granted to WILLIAM BUSK, *of Bankside, in the County of Surrey, Engineer, for certain Improvements in propelling Boats, Ships, or other floating Bodies.*—Sealed July 10, 1835.

WITH AN ENGRAVING.

To all to whom these presents shall come, &c. &c.,—*Now know ye*, that in compliance with the said proviso, I, the said William Busk, do hereby declare the nature of my invention, and the manner in which the same is to be performed, are fully described and ascertained in and by the following description thereof, reference being had to the drawing hereunto annexed, and to the figures and letters marked thereon, (that is to say) :

It is well known that water contained in a vessel has a tendency to drive out the sides of, or burst, such vessel by pressure in every direction in proportion to the perpendicular height at which the water stands. And it is also well understood that if an opening be made at any portion of the vessel, the pressure on that part will be relieved by the flowing of the water therefrom, at the same time the pressure in other directions remains the same so long as the head of water is maintained at one water line, and it will readily be understood that if the vessel were free to move, and had no opposing force greater than the unbalanced internal pressure, the pressure on the side of the vessel opposite the opening would cause the vessel

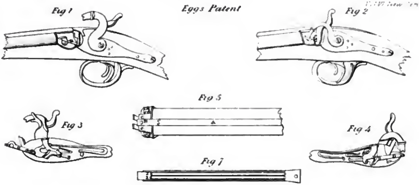
to move in a direction opposite to the opening, such action resembling in principle the working of the hydraulic-machine called "Barker's Mill." Now the object of my invention is to apply the principle subject to a certain law, hereafter described, with respect to the altitudes of the head of water, aided by requisite mechanical means, to the propelling of boats, ships, or other floating bodies.

Description of the Drawing.

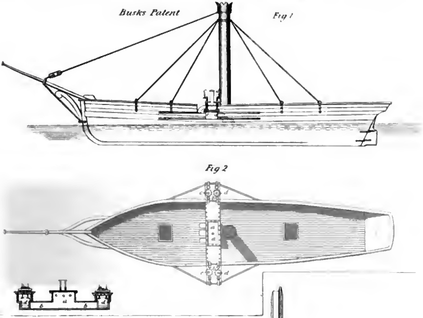
Fig. 1, is a side view, and fig. 2, a plan of a boat or vessel, having my invention applied thereto.

Fig. 3, is a section of the tank and troughs separately. In each of these figures the same letters indicate similar parts, *a*, being a tank or vessel which may be situated in any convenient part of the boat or vessel or other floating body, this tank is to be kept constantly supplied with water by a steam engine, or by other power; on board the boat, *b*, *b*, are two trunks leading from the tank, *a*, and may be said to form part of such tank. These trunks, *b*, protrude over the sides of the boat, ship, or other floating body, as is clearly shown in the drawing. *c*, *c*, and *d*, *d*, are sluice gates or valves capable of being opened or closed, as is clearly shewn in the drawing, for the purpose hereafter described, and which are preferred to discharge their water above the water line of floatation. Now it will be evident that if the tank *a*, be filled with water to any particular water line, the same will press against the sluice gates or valves, *c*, *c*, and *d*, *d*, in proportion to the height of the column of water in the tank, and it follows that if the head of water be kept to rather more than one foot, the lower portion of the sluice gates or valves, *c*, *d*, will be pressed on with a force of about half a pound to the square inch, therefore if the two valves or sluice-gates, *c*, were to be raised one inch, and each sluice-gate or valve were twenty-four inches wide, there would be by the opening of those two sluice-gates a revolving of the pressure of forty-eight square inches equal to nearly

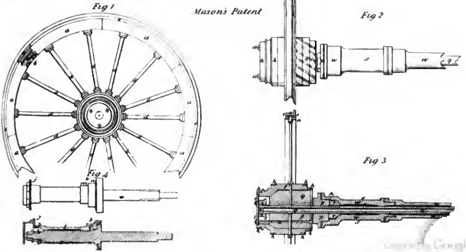
Eggs Patent



Busks Patent



Mason's Patent



twenty-four pounds (supposing the same head of water is constantly maintained) in the tank, *a*. By this means it will readily become evident that the pressure on the sluice-gates or valves, *d*, remaining the same, such pressure will exceed by twenty-four pounds the amount of pressnre on the sluice-gates or valves, *c*, and the boat or vessel will be forced forwards by a power equal to twenty-four pounds. If the gates or valves, *c*, be raised two inches, the excess of pressure on the valves, *d*, over that on the valves, *c*, would be greatly increased, but would not be double that of the first opening unless the head of water were increased. If it be desired to obtain stern way to the boat, ship, or other vessel to which my invention may be applied, the sluice-valves or gates, *c*, must be closed, and the sluice-valves or gates, *d*, are to be opened, whereby the pressure of the water would be on the sluice-valves, *c*, the pressure being relieved at the sluice-valves or gates, *d*, the boat, ship, or other floating body, would be propelled stern ways, that is, in an opposite direction to that first described. From the foregoing description it will readily be understood, that by working the sluice-gates on either side of the vessel, so that there is a preponderance of pressure on one side of the vessel in the event of the rudder being carried away, the vessel may be steered as well as propelled by the head of water. And it is highly important to remark that in order to apply such principle to obtain the most beneficial effect with a given quantity of power employed on board for raising the water, it is necessary so to arrange and combine the mechanical apparatus or means in such manner as to keep down the height of the head of water to the lowest practical working level. According to the ordinary calculations in use a horse power is said to be equal to 33,000lbs. raised one foot high per minute, whhic in water will be nearly 550 cubic feet. Now the propelling effect produced to the boat, ship, or other floating body by a quantity of water equal to each horse

power employed for raising the water, will materially depend on the height at which the constant head is to be kept in the tank, *a*. For it is well known that any sized opening under the pressure of a one-foot head, will only produce a flow of water equal to about one half of what the flow would be at four feet head, and so on for greater altitudes. If, therefore, the constant level be kept equal to one foot, then there would be a constant unbalanced pressure of about half a pound on each square inch of the dimensions of the openings, and in an opposite direction to such openings. If, however, the head were kept at a four-feet level the same sized opening would emit about double the quantity of water within a given time at an unbalanced pressure of two pounds on each square inch of the opening, and in an opposite direction to the opening, but it will be evident that, notwithstanding the pressure is increased four-fold by the using the four feet head in place of the one foot head, as above described, there will be the disadvantage that a given quantity of power employed in raising the water to a four-foot head, will only produce an effective power for propelling the boat, of half what it would be if the water were raised to a one-foot head. This will become more evident by supposing that a given quantity, say 550 feet of water per minute, would be emitted from the openings at the sluice-gates, at one foot head; this would give a constant pressure of half-a-pound for each square inch of the opening, and the quantity of power required would be one-horse power to keep up the supply. The same opening at a four-feet head would discharge this quantity of water at each half-minute, therefore in order to maintain the supply of water to a tank of water with a four-feet head, twice the quantity, or 1100 cubic feet of water per minute would be required to be supplied, which would be equal to eight horses power when raised four feet; yet this quantity, at this head, would only give a constant unbalanced pressure, as above stated, of two pounds for each square inch, in a direction

opposite to the opening, therefore to sustain the four-fold pressure required, eight times the power is necessary to raise the requisite supply of water. The necessity of keeping down the working head of water, in order to obtain the fullest effect from the power applied to raise the water will now be evident, and I have thought it desirable thus to go at length into this part of the application of the principle to the purposes of propelling boats, ships, and other floating bodies, as it is the application, by mechanical means or apparatus, of the principle of the pressure of water, subject to this property of regulating or keeping down the working head of water, which constitutes the main feature of my invention.

Having thus described the nature of my invention, I would remark, that I have not thought it necessary to shew a steam or other engine in the boat, in order to avoid complexity; but the same, or other requisite means, for keeping up the desired head of water will be readily applied by an engineer. And I would also remark, that I am aware that various descriptions of machinery have been heretofore tried, for forcing water from a ship or vessel in order to propel the same, but the difference in principle, as well as in action, to that above described will readily be evident when it is borne in mind that the pressure or force used by me in propelling boats, ships, or other floating bodies, is that portion of the pressure of a column of water which is left unbalanced and subject to the law of reduced heads or altitudes, as above described, whilst, in those instances above referred to, the propelling effort is obtained by forcing water by pumps, or forcing machinery against water.

Having now described the nature of my invention, and having shewn a mechanical arrangement suitable for applying the principle of unbalanced pressure of a head of water subject to the law of reduced heads or altitudes, as above described, I would have it understood that I do not confine myself to the use of the precise arrangement of mechanical

apparatus or instruments shewn and described, as they may in some degree be varied, keeping in mind the necessity of the capability of changing the direction of the pressure in order to obtain stem or stern-way, as above described. —In witness whereof, &c.

Enrolled January 10, 1836.

Specification of the Patent granted to WILLIAM MASON, *of Brecknock Terrace, Camden Town, in the County of Middlesex, Engineer, for certain Improvements on Wheels, Boxes, and Axle-trees of Carriages for carrying Persons and Goods on Common Roads and Railways.*—Sealed September 24, 1835.

WITH AN ENGRAVING.

To all to whom these presents shall come, &c. &c.,— *Now know ye*, that in compliance with the said proviso, I, the said William Mason, do hereby declare the nature of my said invention, and the manner in which the same is to performed, are fully described and ascertained in and by the following description thereof, reference being had to the drawing hereunto annexed, and to the figures and letters marked thereon, (that is to say):

Description of the Drawing.

Fig. 1, represents a portion of a wheel constructed according to my invention.

Fig. 2, an edge view of fig. 1, and

Fig. 3, a transverse section of the wheel. In each of these figures the same letters of reference indicate similar parts. These improvements, so far as the wheel is concerned, consist in the manner of constructing and combining the parts of the felloes, which are to be of wrought-iron. *a*, *a*, are a series of parts which constitute the felloe of the wheel which overlap each other at the joints, as will be clearly traced by an examination of the section

at *b*, in fig. 1, and the shape of the various parts, *a, a*, will be seen in the section, fig. 3. These parts, *a*, consisting of rolled-iron with angles or projecting edges, *c, c*, at each side thereof, as is clearly shown. *d, d*, are the spokes of the wheel which enter into openings formed in the parts, *a, a*, and into the nave, there being enlarged collars or bearings formed on such spokes, one at each end, which come respectively one against the felloe and the other against the nave, which may be most clearly traced in fig. 3. *e*, is the tire or outer ring of the wheel, which, in the instance shewn in the drawing, is intended for edge-railways, but in case they are to run on turnpike or common roads, then the flanch or rim at the edge is to be omitted, and the two sides made similar to the outer one shown in fig. 3. *f*, is the outer portion of the nave which is of cast-iron, its shape and construction is clearly shewn in the drawing. *g*, fig. 3, is the inner portion of the nave, which is of wood. *h, h*, are a series of wrought iron hoops for strengthening the nave. I would here remark that variously constructed naves may be used in combination with a wheel constructed according to my invention; that shewn in the drawing, is one which it is desirable to use in order to employ other of my improvements hereafter described, with reference to boxes and axletrees of wheels. I will not proceed further in the description of the nave in the present instance, but state the manner of putting the parts of the wheel, hereinbefore described, together. The parts, *a, a*, of the felloe, being curved accurately are brought one at a time to the spokes, which are first put into the nave, and the whole wheel being built up, and the space, *i*, of the felloe being filled with wood, the outer ring or tire is to be put on by first heating it, in order to expand its dimensions, and when put on to the felloe, *a, a*, the cooling and shrinking of the tier will bind all parts securely together, and constitute a very strong, yet light, wheel.

I would here remark, that the novelty of this construc-

tion of wheels consists in the peculiar construction of the parts, *a*, *a*, and of their being made of wrought iron, constituting the felloe of the wheel, (that is to say) : having the two outer edges turned up, as at *c*, *c*, which not only produce lightness of construction, but, at the same time, great strength; and the shrinking of tire will be resisted, first by the projecting edges, *c*, *c*, whilst greater shrinkage will be allowed by the wood which fills up the space between the projecting edges, *c*, *c*, and hence the tire will be most securely held and prevented from coming off, whilst the wood will offer an elastic resistance, which, however, is not new in itself, a similar contrivance having been before resorted to, by placing wood in grooves formed around the felloes of cast-iron wheels, but not in wrought-iron ones.

I will now proceed to describe the second part of my invention, which relates to improvements in the boxes and axle-trees of carriage-wheels. My first improvement in such boxes consists in constructing the same of wrought-iron in place of cast-iron, as hereafter described, in order to obtain sufficient strength of axle-tree-box with less bulk, whereby, when the same is inserted in the nave, it will not occupy so much room as those made in cast-iron, which is of considerable consequence in making wheels, for, if the same sized nave be used, it will be evident that less of the interior being cut away for the box, greater strength will be obtained than that from a similar nave with a cast-iron box, and likewise in case greater strength be not required, then the nave may be reduced in size when the wrought-iron box is used, by which greater elegance and lightness of appearance will be obtained to the wheel.

Fig. 4, represents an axle-tree-box constructed of wrought iron according to my invention. The best means of forging such wrought iron-box with which I am acquainted, is, to take a plate of iron of the length from *j* to *k*, in fig. 4, the three edges thereof being

levelled in opposite directions where they are to overlap in welding. And having cut out the longitudinal grooves or recesses, *l*, *l*, for the oil, I turn such plate over a maundril, and proceed to weld the same in like manner to welding tubes. I then take a second plate of iron, but thicker than the first piece, and turn it up and weld it into a short tube, which is next to be welded to the first formed tube; this second tube forms the part from *m* to *n*, as shewn at figure 4. The tube thus formed is then to be bored, and the recess or groove, *o*, to be formed therein, and the requisite screw is to be cut at *p*, at the outer end of the box, as is shewn in figure 4. Having thus described one method of making wrought iron boxes, I would remark that I do not confine myself to that system of forging and welding, but do claim the constructing of axle-tree boxes of wrought iron, when the same have a series of longitudinal recesses or grooves formed therein. I will now describe my second improvements in boxes and axle-trees which are applicable to that description of axle-tree which is keyed or made fast in the nave of the wheel. This third part of my invention is shewn in figures 1, 2 and 3. *q*, the axle-tree, which may be either hollow or solid, running from side to side of the carriage. The one shewn in the drawing is hollow. *r*, is a conical collar affixed and prevented turning on the axle-tree by keying it, but it is capable of sliding in order to be forced up when the surfaces become worn. These collars, *r*, turn with the axle-tree, *q*, and they prevent the play of the wheel endways. The axle-tree, *q*, is made fast to the nave of the wheel by keys and by the screw-nut, *s*; the plate, *t*, which has a screw, *v*, projecting from its surface, which screws into the hollow axle-tree, *q*, and the plates, *t*, is secured to the nave by the screw bolts and nuts, *u*, as is clearly shown in the drawing. And it is the application of the collars, *r*, and the means of securely affixing of the axle-tree, *q*, to the nave by the screw nut, *s*, the plate, *t*, and screw *v*, and

the screw-bolts and nuts, *u*, as above described, though I do not claim any of those parts when used for other purposes. *w*, is the axle-tree-box which is used with the improved axle-tree, *q*, and this box consists of a hollow tube proceeding from side to side of the carriage, the part, *x*, thereof being that which in reality constitutes one of the boxes wherein the bearing of the axle-tree takes place. The part, *x*, being capable of screwing to the other part, *w*, as shewn, and to the screw-nut, *y*, by which the conical collars are forced up to shut in the oil, and regulate the play of the wheels endways, there being suitable washers of leather at each of the joints. The axle-tree-box or part, *x*, has recesses, *z*, cast therein when the box is formed of cast iron, in like manner to ordinary cast iron patent axle-tree boxes, and when they are made of wrought-iron, the groove may be formed therein, as before described with reference to wrought-iron axle-tree boxes. The axle-tree box, *w*, *x*, is to be affixed to the carriage, or the springs thereof, at the point, A, by means of an iron strap which encircles the axle-tree box, and the same is held securely from turning in such strap by keys acting on flat surfaces, as is well understood, or the part, A, may be formed with projecting ears by which the same may be securely held to the carriage or to the springs thereof with suitable screw-bolts and nuts; but when the springs extend beyond the wheels, then the wheels must be affixed upon the boxes, which will revolve, whilst the axle stands still; and the axle must extend on each side beyond the boxes, and to which extensions of the axle the springs of the carriage must be affixed.

Having thus explained the nature of my invention, and the manner of carrying the same into effect, I would remark, that I lay no claim to any of the parts herein described, excepting so much thereof as has been particularly pointed out as constituting my improvements.—In witness whereof, &c.

Enrolled March 24, 1836.

Specification of the Patent granted to Daniel Rutter Long, *of Bath, in the County of Somerset, Chemist, for certain Improvements in a new mode of Applying certain Anti-putrescent and Flavouring Substances to Meat.*—Sealed November 13, 1834.

To all to whom these presents shall come, &c. &c.—*Now know ye*, that in compliance with the said proviso, I, the said Daniel Rutter Long, do hereby declare that the nature of my said invention, and the manner in which the same is to be performed, are particularly described and ascertained in and by the following description thereof, (that is to say):—

My invention consists in injecting certain anti-putrescent and flavouring preparations into the blood vessels, by means of a force pump. In this way the whole of the animal becomes impregnated instantaneously, I recommend the mouth of pipe (leading from the pump) to be inserted into the heart, but if that by any chance is torn or cut so as to be unfit for it then inject into the large vessels; I also recommend the operation to be performed as soon as it can after the animal is killed.

Kill the animal by striking a blow on the head or by cutting the throat according to the class of animal, then turn him on to his right side and thrust the knife into the heart. The incision should be made as near as possible to the breast bone, but not exactly upon it, about an inch to the left of the centre of the bone, and it will pass easily through the cartilage (or gristle) which joins it to each of the ribs. Let the cut be made, if possible, between the ends of the sixth and seventh ribs, and the knife will generally pass into the heart exactly in the spot I recommend to be made for the introduction. When the animal has bled, which he will not appear to do freely (as the blood remains in the chest with pigs), I recommend the scalding or burning to be done as quickly as

possible, and let him be scraped. Then place him upon his back on a clean bench, and carefully open the chest through the whole length of the blade-bone. Be sure not to cut the heart or any of the large vessels, the greatest danger, if any, is near the throat, for unless the knife goes very cautiously some of these will be divided, and the injection of the fore part of the body rendered a very tedious operation. Having opened the chest, place a stick between to keep it so, and cautiously open the pericardium (membrane covering the heart), raise the heart with the left-hand, turn it a little to the right, and make an incision into the left ventricle, which is the thickest and strongest part of the heart. Let it be made near the point of the heart, and just large enough to admit the pipe of the force-pump. If the cut which was first made, after knocking down the animal, should happen to be in the right spot, as is often the case, that will do, or only require enlarging. Having the pump and preparation ready, introduce the pipe two or three inches into the heart, and press it round the pipe; then let a man steadily and gently pump, and having made incisions into the feet and nose, and cut off the tail, you will at all these parts see the liquor ouse out as it is injected: when no more can be injected, which is known by its escaping from the heart, the operation is finished, and the animal may be dressed as usual, and allowed to cool, but do not divide him until he has hung some hours, or even till the next day unless to be consumed. The more the animal is divided, of course more fluid escapes without acting upon the meat. In case of the large blood vessels being cut or broken, the liquor is forced into the cavity of the chest, and has no effect on the body of the animal. You must then carefully inject the hinder part of the body through the posterior aorta (the pipe passing down by the back bone), and afterwards the upper part of each division of the large vessels, fixing a smaller mouth-piece on to the pipe. In this case, generally speaking, I would

not for small animals recommend an attempt at injecting the fore part as it would hardly pay the trouble, but to inject the hinder is a most simple and easy process. Where a little care is used in cutting through the breast-bone it is hardly possible for the operation to fail, and the whole is equally and thoroughly impregnated and flavoured at the will of the operator.

The materials I have used and find to answer are as follows, but I do not confine myself thereto, as there may be others which are suitable for the purposes. The strongest preparation, No. 1, is for preserving meat at once instead of the usual process of salting: after injecting, and the animal is become cold, it may be packed away between layers of salt and nothing more done to it.

No. 1. Four gallons (imperial) of water, eighteen pounds of salt, sixteen pounds of salt-petre. Keep these on the fire till the salts are dissolved, then take some from the fire, and, when the hand can be borne in it, inject it; pump the air out of the pump and pipe before inserting the latter in the heart. Keep some of the liquor on the fire to fill up the vessel as it is cooling, for when several animals are to be operated upon it is better not to take all from the fire at once. For curing bacon and giving the smokey flavour at the same time, add to the above a small quantity of Westphalian liquid, and for flavouring spices may be boiled with the preparation, and the bacon or beef will exceed the flavour of any cured the old way.

Preparation, No. 2. Sixteen pounds of salt, four gallons (imperial) water, where the red colour is not required, as for beef, &c. for exportation. No. 2, preparation, will answer with packing it with layers of salt between. This also is good for meat to keep many weeks hung, and then washed in water and cooked as fresh meat; a small quantity of salt-petre may be added if prefered. This preparation reduced in strength will preserve meat according to the proportions of water added to it. No. 2, should

be calculated without any other application to preserve for six weeks; use it cold.

No. 3. Two pounds of salt, one imperial gallon of water. This only half the strength of No. 2, and calculated for preserving for two or three weeks, soaking the meat a short time before cooking, and the addition of vinegar to preparations injected are likely to improve it very much.—In witness whereof, &c.

Enrolled May 13, 1835.

Specification of the Patent granted to John Hewitt, *of Kenegie, Cornwall, Gentleman, for a Combination of certain Materials or Matters, which being combined or mixed together will form a valuable Substance or Compound, and may be used with or as a Substitute for Soap.*—Sealed April 19, 1834.

To all to whom these presents shall come, &c. &c.,—*Now know ye*, that in compliance with the said proviso, I, the said John Hewitt, do hereby declare the nature of my invention, and the manner in which the same is to be performed, are fully described and ascertained in and by the following description thereof, (that is to say):—

My invention consists in combining the well known substances called mica, steatite, porcelain earth or clay, and gard or guard with soap, in the proportions herein particularly defined.

Having thus stated generally the object of my invention, I will proceed to describe the manner of performing the same; I take from one-eighth to three-fourths by weight of mica, steatite, of porcelain clay, or of gard, ground or reduced to a fine powder, or I take from one eighth to three-fourths of these substances combined, and mix or incorporate such one-eighth to three fourths with seven-eighths to one-fourth by weight

of the ordinary soap of commerce, known by the names of mottled and yellow soap, but I prefer, and usually employ, one-half of the earthy substances and one-half of soap, which, when combined in any of these proportions, will form a compound to be applied to the ordinary purposes of soap.

When it is desired to make a finer quality of soap intended for the purposes of the toilet, I take from one-eighth to one-half by weight of mica, steatite or porcelain earth or clay, and mix or incorporate the same with seven-eighths to one-half of the soap of commerce called curd soap, and thus produce a valuable compound, which may be perfumed as is usual in fancy soaps.

Having thus given the definite proportions which constitute my invention, I will now point out the manner pursued by me in mixing or compounding the aforesaid substances with soap. Having determined on the proportion of mica, steatite, porcelain clay or earth, or of gard, which, as aforesaid, must be within the proportions of one-eighth to three-fourths by weight of the mass intended to be produced, and this is to be the case whether these substances are combined or used separately, for it is essential that these substances should not exceed or be below the proportions by weight here given, these being essential to the best effect being obtained. The soap, whether yellow, mottled or curd is sliced into small pieces, and mixed with the substance or substances above mentioned, and the whole mixture or compound being placed in a suitable vessel is to be melted (sufficient water being added to facilitate the operation), and the compound, when well stirred and sufficiently blended, is to be allowed to cool in the ordinary manner of making soap, and cut into bars, it will then be ready for sale. Or it will be evident that in place of taking the soap of commerce, the compound may be produced by adding the substances in the proportions aforesaid to the melted materials of soap previous to allowing them to cool,

which would be the most advisable course for a soap maker. It will be, perhaps, desirable here to observe, that the substances hereinbefore mentioned are found plentifully in Cornwall, and that the substance named gard or guard, is that part of the sediment which first precipitates itself in washing or cleansing porcelain earth or clay for the use of the China manufacture.

Having now described the nature of my invention, and the manner of carrying the same into effect, I would observe that I am aware that the various clays and earthy substances have been before used for cleansing both separately, and in some instances combined with soap, I do not therefore claim the mixing of the aforesaid substances generally with soap, or of the application of them to the purposes of scouring or cleansing other than in the proportions before mentioned. I do therefore hereby declare that I confine my claim of invention to the mixing or compounding of mica, steatite, porcelain clay or earth, and gard, within the proportions of from one-eighth to three-fourths by weight of the bulk of the compound to be produced with the ordinary soap of commerce, as above described, and thus producing a valuable compound applicable to the various purposes of soap.—In witness whereof, &c.

Enrolled October 18, 1834.

Specification of the Patent granted to James Leman, *of Lincolns' Inn Fields, in the County of Middlesex, Gentleman, for the Making, Mixing, Compounding, Improving, or Altering of Soap.*—Sealed June 4, 1835.

To all to whom these presents shall come, &c. &c.,—*Now know ye*, that, in compliance with the said proviso, I, the said James Leman, do hereby declare that the nature of my invention, and the manner in which the same

is to be performed, are described and ascertained in the manner following, (that is to say):

The oxymuriatic gas or chlorine is sold in commerce combined with soda, with potash, and with lime, under the denominations of the chlorate or oxymuriate of soda, the chlorate or oxymuriate of potash, and the chlorate or oxymuriate of lime; the first two in a state of solution, and the last in an earthy state. Chlorine combined with these three alkaline substances has been employed in washing and bleaching, but where combined with soap, as described below, advantages and considerable economy are effected in both these operations, and that combination I claim as my invention.

The following are my processes or combinations:

First.—To make chlorated soap in employing the chlorate or oxymuriate of soda.—1st. Take equal quantities by measure of a solution of chlorate of soda of a specific gravity of 1089, and of oil, and mix them perfectly together.—2nd. Heat the mixture over a very gentle fire to assist its combination.—3rd. Add to the mixture, ley of caustic soda, and continue the operation in the same manner as done by soap-makers, employing successively the ley of various degress until the saponification is complete.

If, instead of oil, it is wished to employ fat or other saponifiable substance, it will be necessary to melt it previonsly over the fire, and then the mixture with the solution of chlorate of soda, and proceed in the same manner as is above directed for oil.

Second.—Chlorated soap by the chlorate of potash.—The process for the manufacture of this soap is the same as the preceding: mix equal parts by measure, of a solution of chlorate of potash of a specific gravity of 1089, and oil or fat, or a mixture of both. Heat the mixture gently, and add the quantity of ley of caustic of potash or of caustic soda necessary to render the soap perfect. In

other respects proceed in the same manner as the common manufacturers do.

Third.—Chlorated soap by the chlorate of lime.—To make this soap.—1st. Mix thoroughly one part by weight of chlorate of lime with three parts of water, let the insoluble part subside and draw off the clear solution, which is commonly of a specific gravity of about 1072. Make a mixture of this solution with an equal quantity of oil or fat, or of a mixture of both, and stir up this mixture at intervals during three days, so that the combination of the chlorate of lime with the oil or fat may be complete.—3rd. Add ley of caustic soda at different degrees of strength as is done by manufacturers to make common soap.

Nota.—If fat or grease is employed it will be necessary to mix it with the chlorated solution in a heated state. In other respects the process is the same as before described.

The chlorated solution may be employed weaker, that is to say, if a specific gravity of 1033 or more. After having made the mixture with the oil, it will be necessary to stir it well and let it settle for twenty-four hours, draw off the water, then repeat this operation until the oil is saturated with chlorine to the degree desired. As to the quantity of water retained by the mixture it will be separated from it during the process of saponification, and will remain mixed with the water of the ley employed.

These kinds of soaps may be made by mixing the ingredients cold, and letting them remain for at least twenty-four hours, stirring them often. The ley must be employed at 1360, in the proportion of one-third of the quantity of oil used. Apply a gentle heat (a water or steam bath is preferable on account of the colour), until the saponification is complete.

If common soap is melted in a solution of chlorate of soda upon a moderate fire, this soap will become chlorated but it never will be so well combined as that of which the manufacture is above described.

A solution of chlorate of lime may also be added to common soap dissolved, by this means a chlorated soap will be obtained.

If it is wished not to employ the chlorate of soda of potash or of lime for the manufacture of soap, they may be replaced by water saturated with chlorine; or it is still better to saturate the oil or grease by means of a current of chlorine applied directly to it without the intervention of any alkali.

I claim also to form a chlorated soap through the medium of a combination of chlorine with all other alkaline substances. In witness whereof, &c.

Enrolled December 4, 1835.

PROGRESS OF SCIENCE

APPLIED TO THE ARTS AND MANUFACTURES, TO COMMERCE, AND TO AGRICULTURE.

ON THE THEORY OF GRADIENTS ON RAILWAYS. By Mr. W. S. B. WOOLHOUSE.—Mr. Woolhouse has addressed the following letter, dated February 20, 1836, to the Editors of the London and Edinburgh Philosophical Magazine, in reference to the papers of Dr. Lardner and Mr. Peter Barlow, which we transferred, from that work, to the "Progress of Science" in our number for March last.

As Dr. Lardner and Mr. Barlow hold out conflicting opinions on the theory of gradients on railways, and have left the subject in a state more calculated to create doubts in the minds of the less informed of your readers than to lead them towards the formation of settled conclusions, perhaps you will favour me with the insertion of a few words, by way of explanation, as far as the philosophy of the question presents itself to my mind. Mr. Barlow, without absolutely

saying which of the two solutions is wrong, though probably quite conclusive in his own view of the matter, first states his objection to the arithmetical results of the formula employed by Dr. Lardner for the velocity, in certain cases, then gives an outline of his principle of investigation, and finally expresses himself "quite content to leave the decision to those whose minds have not already received a bias from pre-conceived notions of the forces." Whatever sentiments may prevail as to the competency of my opinions on such a subject, it will at least be acknowledged that I possess the qualification of being free from the bias here alluded to, and I am induced to hope that your readers will, on this very ground acquit me of any imaginable interference in thus undertaking, voluntarily, the examination of a point that has already had the attention of such distinguished individuals. By close and continued application of particular opinions to particular subjects, it is indeed surprising how they fix themselves in the mind, and become ultimately, whether true or false, of almost a fundamental character. But I do not consider this observation to be applicable to the present case. It is my wish to simplify and expose the truth as far as I can perceive it. I do not, however, intrude the present remarks in elucidation of the subject without some degree of hesitation, although quite free from apprehension as to their theoretical soundness. To many of your readers, who must be far from satisfied with the present situation of the question, I nevertheless feel myself justified in submitting them.

According to Dr. Lardner, the subject is "totally distinct from the consideration of accelerating forces;" he considers it to be essential that the velocities be continued uniform, and therefore discards every thing in the shape of an accelerating force. Now, in order that such a theory may be sustained, it is a well known elementary principle of forces, that the power employed must be always precisely equal to the resistance, or the amount of friction

combined with the proper resolved effect of gravity along the railway, observing, however, that in the term friction, we must include the resistance to the motion experienced by the carriages, &c., in passing through the atmosphere. We shall not here discuss the practicability of preserving this exact balance between the forces at the various changes of inclination; nor shall we offer any serious objection to the principle that the friction is the same for all velocities, which has received the sanction of general practice, though doubtless inaccurate, as far as regards the effect of the atmosphere.

Continuing the notation of the preceding letters, we have t, for the moving power that will keep the load moving at a uniform speed, V, along the level plane; $t + \sin \iota$ for the moving power to keep the load moving at the same uniform speed up the inclined plane; and $t - \sin \iota$ for the moving power to sustain the same uniform speed down the inclined plane. To the truth of this there cannot be any doubt, if we assume, as Dr. Lardner has done, that the friction t is not altered by the slight inclination of the plane. By following Dr. Lardner's reasoning, we are hence fairly led to the result that the same amount of mechanical force will be expended in ascending and descending the inclined plane, as in drawing the same load backwards and forwards along the level plane of the same length L.

Though Dr. Lardner is certainly justified in stating this conclusion to be a plain result of first principles, it should, at the same time, be remembered, that it rests solely on the hypothesis that the power in each case is to be precisely adapted to the amount of resistance, so as to preserve throughout the same uniform velocity V. This hypothesis has not been admitted by Mr. Barlow, and it must necessarily fail in determining the effect produced by the deflection of a rail during the transitory passage of the carriages. In this way, it appears to me that the principle advocated by Dr. Lardner, carries with it a restriction that entirely

unfits it for an objection to what has been advanced by Mr. Barlow, in his Second Report, addressed to the Directors of the London and Birmingham Railway Company. On the other hand, "however, I can only come to Mr. Barlow's conclusion, that it is altogether erroneous, both in theory and practice," when the assumed maintenance of uniform motion is objectionable, as it most certainly is, in the case of the deflections of rails. Contenting myself at present, then, with the opinion that the contending parties thus view the question of power expended, on different suppositions as to the way in which it is applied, I shall just take a very brief sketch of the question of velocity, when the motion is not assumed to continue the same through planes of different inclinations.

Dr. Lardner supposes that in cases of uniform velocity, the resistance into the velocity is constant, and on this assumption deduces the equations stated by Mr. Barlow in (Repertory, March 1836) page 181, viz.

$$(\iota - \sin \iota)\ v = \iota V \qquad v = \frac{\iota V}{\iota - \sin \iota}$$

This assumed principle is, in my opinion, decidedly inaccurate, more especially, when it is contemplated that the carriages will pass along with the uniform velocity so expressed. For uniform motion can only be continued when the moving force continues equal to the resistance; and assuming with Dr. Lardner, that the amount of friction is independent of the velocity, the speed will in such a case be quite indeterminate, or, in other words, the power so applied will sustain uniformly, *any velocity* that may have been previously communicated. If the friction were *really* independent of the velocity, while a moving force which exactly balances the resistance would maintain uniformly *any previously imparted motion*, a moving force which exceeded the resistance would transmit the carriages with a velocity continually accelerated, in conformity with what has been said by Mr. Barlow: but as the portion of resistance arising from the atmosphere at least increases with

the velocity, it is evident that the resistance will gradually augment till it balances the moving force, and so a uniform motion will eventually succeed. If the carriages be so acted upon as to retain a uniform velocity v along a level plane, and with such velocity and moving power they arrive at the upper end of, and proceed down, an inclined plane, the investigation given by Mr. Barlow (London and Edinb. Phil. Mag. vol. viii), pages 98—100, will be strictly accurate on two suppositions, viz., 1, That the friction is independent of the velocity and inclination of the plane. 2. That the action of the moving power is not diminished by the increase of velocity. The former supposition is sanctioned by Dr. Lardner; the latter, as Mr. Barlow justly observes, if not true, will have the effect of giving the velocity and space passed over, rather in excess of the truth, and therefore the more favourable for a comparison with Dr. Lardner's velocities, which are so much in excess. There can be no doubt as to the inaccuracy of the preceding formula, from which the last-mentioned velocities are calculated, as the principle from which it is derived is not founded in theory.

Magnetic Experiments on an Iron Steam-Vessel. By Commander E. J. Johnson, R.N.—The following is an abstract, from the proceedings of the Royal Society, of a paper read before that learned body, on March 10, 1836.

Report of Magnetic Experiments tried on board an Iron Steam-vessel, by order of the Right Honourable the Lords Commissioners of the Admiralty. By Edward J. Johnson, Esq., Commander, R. N., accompanied by Plans of the Vessel, and Tables shewing the horizontal deflection of the Magnetic Needle at different positions on board, together with the dip and magnetic intensity observed at those positions, and compared with that obtained on shore with the same instruments. Communicated by Captain Beaufort, R.N., F.R.S., Hydrographer to the Admiralty; by command of the Right Honourable the Lords Commissioners of the Admiralty.

This report commences with a description of the iron steam-vessel, the "Garryowen," belonging to the city of Dublin Steam Packet Company, and built by the Messrs. Laird, of Liverpool. She is constructed of malleable iron, is 281 tons burthen, and draws only five and a quarter feet water, although the weight of iron in the machinery, &c. is 180 tons.

This vessel was placed under the directions of the author, in Tarbert Bay, on the Shannon, on the 19th of October, 1835, for the purpose of investigating its local attractions on the compass. The methods which were adopted with that view are given; together with tables of the results of the several experiments, and plans of the various parts of the Garryowen. The horizontal deflections of the magnetic needle at different situations in the vessel were observed, for the purpose of ascertaining the most advantageous place for a steering compass, and also for the application of Professor Barlow's correcting plate: and the dip and intensity in these situations were, at the same time, noted.

An experiment is detailed, showing that where several magnetic needles, freely suspended, were placed upon the quay, in Tarbert Bay, and the vessel warped from the anchorage towards them, first with her head in that direction and then with her stern, opposite deflections were produced: in the first case all the needles shewing a deviation to the eastward, and in the latter to the westward, of the true magnetic meridian.

Considering the height of the general mass of iron in the vessel and also that of the head and stern, together with the distance (169 feet) at which some of the needles indicated a deviation, the author concludes that the respective deflections were caused by the magnetic influence of the iron in the vessel; the combined effect of that about the bows representing the north pole of a magnet, and that about the stern a south pole. He then offers several suggestions for future observation on this subject,

and connected with the little oxidation that is reported to have taken place in the vessel.

The experiments having been interrupted by a continuance of wet and stormy weather, the author proceeds to draw the following general practical conclusions, deduced from the series of observations already made, and points out the further experiments which he considers necessary to be tried.

1st. The ordinary place for a steering-compass on board ship is not a proper position for it in an iron steam-vessel.

2nd. The binnacle-compass in its usual place on board the Garryowen is too much in error to be depended upon.

3rd. In selecting a proper position for a steering-compass on board iron steam-vessels, attention should be paid to its being placed, as far as is practicable, not only above the general mass of iron, but also above any smaller portions of iron that may be in its vicinity, or such portions of iron should be removed altogether.

4th. The steering-compass should never be placed on a level with the ends either of horizontal or of perpendicular bars of iron.

5th. The extreme ends of an iron vessel are unfavourable positions, in consequence of magnetic influences exerted in those situations. The centre of the vessel is also very objectionable, owing to the connecting-rods, shafts, and other parts of the machinery belonging to the steam-engine and wheels, which are in continual motion; independently of the influence exerted by the great iron tunnel in this part of the ship.

6th. No favourable results were obtained by placing the compass either below the deck, or on a stage over the stern.

7th. It was found that at a position $20\frac{1}{2}$ feet above the quarter-deck, and at another $13\frac{1}{4}$ feet above the same level, and about one-seventh the length of the vessel from the stern, the deflections of the horizontal needle were

less than those which have been observed in some of his Majesty's ships.

The author proceeds to point out various methods of determining, by means of a more extended inquiry, whether the position above indicated, or, one nearer to the deck, is that at which the steering-compass would be most advantageously placed.

The concluding section contains an account of some observations made by the author on the effects of local attraction on board different steam-boats, from which it appears that the influence of this cause of deviation is more considerable than has been generally imagined; and he points out several precautions which should be observed in placing compasses on board such vessels.

Observations on the frequent Presence of Lead in English Chemical Preparations; on the Cause of that Presence; and other Remarks relative thereto. By Gustavus Schweitzer.—The examination of the purity of chemical preparations, in which I have been engaged for some time, convinces me that many of them are impure and contain lead. In several which I have examined I have found subcarbonate of magnesia containing lead in the proportion of 2.40 grains subcarbonate of lead in 1000 grains of subcarbonate of magnesia. Bicarbonate of potash contained a similar proportion; bicarbonate of soda, subcarbonate of ammonia, &c., showed the same impurity. It is clear, when these substances, so universally used, contain lead, that many other combinations which are prepared from them must be equally impure. The cause of this impurity arises greatly from the manner in which these substances are prepared. Leaden vessels are too often used for the crystallization and precipitation of them, and how easily alkaline substances act on lead is too well known to need comment. But another cause of this impurity, although the portion present is but very small, is the white glass used in this country, which must be an object of great consequence to practical chemists

and druggists. I know not whether any direct experiments have been made to show what influence alkalies, acids, and salts may have on white glass. I have therefore endeavoured to ascertain this point by the following experiments :—White glass bottles, such as are used for medicine, were taken and filled, some with distilled water and others with common water. No lead was imparted to the water in either case, even after immersion in it for a few weeks exposed to a common temperature; but when the distilled water was impregnated with carbonic acid gas, after a few days the fluid gave, with the proper tests, ample proof of the existence of lead, and when boiled to expel the gas, no indication of lead was obtained, proving that a bicarbonate of lead was formed by the action of the carbonic acid gas on the glass. Acetic acid, nitric acid, muriatic acid also take up lead from white glass. Diluted sulphuric acid, after standing some time in these glasses, shows no indication of dissolved lead; but after pouring off the acid and rincing the bottle with nitric acid, the presence of lead was detected. Neutral salts showed an equal action, when they contained such acids as produce with oxide of lead insoluble combinations, or combinations of very sparing solubility, and produced more or less a film on the glass, which film was dissolved by nitric acid; as the phosphates, oxalates, chromates, sulphates. Chloride of lead is but slightly soluble in pure water, and, according to my analysis, 100 parts of distilled water will dissolve 0.74 part of chloride of lead. Solutions of chlorides will also dissolve chloride of lead, more or less, according to their strength, but still less than distilled water, because when to a concentrated solution of chloride of lead in distilled water a few drops of chloride of calcium 0.2 strength are added, the greater part of the chloride of lead will be separated, but by chloride of calcium in excess, the chloride of lead will be retaken up. (*Bischof, Neues Jahresb. d. Chemie und Physick.*) This I found to occur with the chlorides of ammonium, iron, lithium, magnesium,

potassium, sodium, and zinc, and most likely will be proved to be the case with all chlorides of a corresponding strength. Therefore chloride of lead will be imparted to a solution of a chloride, when kept in white glass bottles acccording to the strength of the solution of the chloride; the more chloride the solution may contain the less will be taken up of the chloride of lead. The chlorides will take up by boiling a considerable quantity of chloride of lead, a portion of which will crystallize when the fluid is cooled down.

Caustic alkalies act very powerfully on white glass, and much oxide of lead will be dissolved. Caustic ammonia acts very slightly on the glass; subcarbonate of potash, soda, and ammonia also take up lead, but considerably less than the caustic alkalies. A strong solution of the subcarbonates will take up less than a diluted one. Volatile oils shew no action on the glass. These experiments prove that the white glass bottles commonly used are not fit for chemical and medical purposes; which fact is worthy of the attention of the medical board. The great addition of oxide of lead in the manufacture of glass to make it more fusible must be avoided. According to the analysis of Faraday, the ordinary flint glass contains 33·28 per cent. of oxide of lead, whereas for all chemical or medical purposes a glass free from lead should be used.*

A piece of lead perfectly clean and bright on the surface was kept in distilled water in a closed vessel, and after some time showed a white crystalline coating of subcarbonate of lead; the fluid was also filled with little crystalline scales. The fluid turned red litmus-paper

* The results of Mr. Faraday's analysis of various kinds of glass, and some remarks upon the true nature of that substance in general (which are confirmed by Mr. Schweitzer's observations above), will be found in some notes extracted from Mr. Brayley's edition of Parkes's Chemical Catechism, in the *Repertory*, new series, vol. i, p. 182, in the number for March, 1834. See also Professor Turner's experiments on glass, vol. ii., p. 298, in the number for November, 1834.—A. T.

blue, and tests indicated freely the presence of lead in the fluid; but when it was carefully filtered through paper which had been freed by weak nitric acid from its impurity, no indication of lead whatever was perceived, shewing that the carbonate of lead was merely dispersed in the water and not dissolved. A similar effect was shown by oxide of lead treated with pure water, but no solution of it was perceptible if it was kept with the water, whether in an open or in a closed vessel;—a fact which is opposed to the received opinions. Well-water and mineral water corrode lead, forming a coating of oxide of lead on the metal without taking up a particle of the oxide; but mineral waters strongly impregnated with carbonic acid gas I found to contain faint traces of lead, when they had been for some time in contact with it. Mr. Walker according to his analysis found in the mineral water of Bath, lead originating from the pipes or pump used for the conveying of the water. (Quarterly Journal of Science, Literature, and Art, January to March, 1829.) Might not the lead in these instances be dispersed mechanically in the water?—The result of my experiments induces me to believe so.

Volatile oil dissolves lead freely. Alcohol and æther, when pure, do not act on that metal. When an alkaline fluid contains a trace of lead, the best test to apply is the hydrosulphuret of ammonia, as this re-agent will detect $\frac{1}{100,000}$ gr. of crystallized acetate of lead; but this is almost the limit of its dilution, as the observation must be made by the light falling upon the surface of the liquid, which must have a diameter of not much less than one inch. In a neutral fluid, or in one which is only slightly acid, the presence of lead may be shewn by the application of sulphuretted hydrogen gas; but it is advisable to avoid the use of nitric acid, as by a little surplus of it, faint traces of lead will be easily overlooked. Acetic acid is preferable, because its surplus does not affect the delicacy of the hydrosulphuretted gas. Very

good tests also are soluble sulphates and chromates, particularly to decide on the nature of the metal, although not to such an extent as the tests before mentioned. Chromate of potash will indicate traces of lead, when sulphate of soda ceases to do so. Sulphate of lead will be partly dissolved by concentrated nitric acid; muriatic acid shows traces of lead, acetic acid only faintly shows them. Chromate of lead when treated with strong sulphuric acid will be changed into sulphate of lead, and the decanted acid will contain no lead. Nitric acid dissolves traces of lead from the chromate; muriatic acid changes the chromate of lead into chloride of lead, and the chromic acid into oxide of chrome, by developing chlorine, particularly by the application of heat. Acetic acid acted on chromate of lead and took up some lead, particularly when the acid was for several days in contact with it: according to Mans (Poggendorff's *Annalen*, band ix. p. 127), it is not soluble in acetic acid.—*Lond. and Edinb. Phil. Mag.*, vol. viii., p. 267, et seq.

Researches in the Art of Dyeing. By M. Chevreul. (*Concluded.*)

Sixth Division.—Of the mutual action of stuffs, of neutral compounds not saline with coloured re-agents, acids, salifiable bases and salts.

The study of the preceding combinations, formed from species perfectly definite, considered as to their properties and composition, is a suitable preparation for that of a more complex character, of stuffs united to ternary and quaternary compounds, such as indigotine, hematine, carmine, alizarine, auriue, luteoline, yellow and white morines, quercitron, &c., definite compounds, which are the characteristic colouring principles of indigo, log-wood, cochineal, madder, *bois de sable*, dyer's weld, *bois jaune*, quercitron, &c., substances employed in the workshops. This latter division includes the cases in which stuffs are present with these definite compounds, and at the same time with acids, salifiable bases, and salts.

There are two points of view from which I regard the fixation of the preceding compounds upon stuffs. The first is relative to the weight of stuff, that the same weight, taken for unity, of each species of colouring principle is capable of dyeing; the second is relative to the influence arising from:

1st. The proportion of water by the intervention of which the substances act:

2nd. The respective proportions of these substances:

3rd. The temperature:

4th. The contact of atmospheric oxygen.

The influence of this latter agent is in several cases remarkable, as I shall shew in a special memoir upon the subject.

I shall here produce the following as an example. The colouring principle that I have named white morine scarcely tinges cotton cloth which has received aluminous and ferruginous mordants; but if it have the proper contact with the air, the most intense yellow and brown colours are developed. I say the *proper* contact, for if the time be unduly prolonged, these intense colours will be destroyed. I shall produce many analogous facts, which will show that this operation takes place, when the colour developed results from a modification by the air, of a definite colouring compound, of the same order as those of which I have spoken.

Seventh Division.—Of the mutual action of stuffs, acids, salifiable bases, salts, and complex tinctorial matters of organic origin.

After the previous inquiries pursued in the order that I have suggested, we enter at last on more complex cases, in which the subject of investigation is not a definite colouring principle which has been sufficiently studied in the isolated state in which it is obtained by chemical analysis, but a substance containing a colouring principle, combined in indefinite proportion, or simply mixed, not only with several colourless bodies, but even, in many

cases, with colouring principles, by which it is more or less modified. The complex colouring matters of organic origin, employed in the work-shops, are the only ones treated of by authors who have written upon the subject of dyeing.

With regard to this art, I have two objects in view:

1st. To explain the phænomena which occur in the operations of dyeing, by investigating their respective causes; these causes will comprehend the determination of the bodies by which the phænomena are presented, and the circumstances under which they are manifested.

2d. To reduce the recipes for dyeing and the processes of the art to their most simple expression.

To attain these objects, we must surmount the difficulties arising from the circumstances that the immediate composition of tinctorial substances is far from being perfectly understood, as I have already stated. Researches of the following kind have appeared to me to be very efficacious:

After examining the effects produced when ligneous stuffs, or those of silk and woollen, are submitted to the action of the different immediate principles of a complex tinctorial matter, or of extracts which, in the present state of science, present these principles in their greatest degree of purity, I examine the effects produced, when the same stuffs are submitted to the action of the complex tinctorial matters themselves, and I seek the explanation of the phænomena presented by the study of the preceding facts.

Many facts are explained by comparative experiments made on the one hand with immediate principles, and the complex substances whence they proceed; and on the other, with the three sorts of stuffs which are the subjects of the art of dyeing.

For example: indigotine, and the indigos of commerce, studied in this manner with regard to the colours which they give to stuffs, paying attention, 1st. to the

diversity of these stuffs; 2nd. to the diversity of the vats in which the operations of dyeing are performed, present theoretical results of great nicety. Thus we see—

1st. That pureindigotine imparts the same colour to silk, wool, and to ligneous substances whatever be the intensity of the original colour *(couleur fixée)*; consequently, that indigotine applied in gradually diminishing quantities *(in dégradation)* upon any part of these stuffs, gives a collective result of correct tints.

2nd. That these results are entirely different when the indigo of commerce is employed, instead of pure indigotine. Varying results arise not only from the nature of the stuffs, but from the specific differences of the vats employed; the reason is, that in the vats pure indigotine is accompanied by yellow, red, and fulvous colouring principles, which are in various proportions in respect to each other, and have different aptitudes for fixing upon cotton, silk, and wool. Thus a diminishing quantity (*une dégradation*) of indigotine, operating upon silk in the blue stone vat, gives the clear tints of a greenish blue, and the obscure ones of a violet blue, whilst the intermediate tints are blue, which is caused by a yellow principle which accompanies the indigotine, the influence of which is sensible in proportion to the paleness of the tint.

Experiments instituted in this manner serve—

1st. To verify the immediate analysis of tinctorial substances; as the perfect knowledge of the immediate principles of one of these substances, must explain all the phænomena presented by it in its employment in dyeing.

2nd. To explain why dyers employed in the dyeing of cotton, have often ideas of the nature of a certain colouring matter, very different to those of persons engaged in the dyeing of silk or wool, which is caused by the complex nature of the colouring matter, which imparts but one colouring principle to cotton, whilst it gives two to silk or wool. This explains the reason that calico printers admit the existence only of a red colouring principle in mad-

der, whilst the dyers of silk, and especially of wool, willingly admit that there are three, red, yellow, and fulvous.

My previous experiments upon colouring matters, particularly upon those of logwood, have been of great service to me, when engaged in determining the compounds to which the stuffs dyed with matters of organic origin owe their colour. In fact, having long known that salts with insoluble bases, that is, those in use in dyeing, under the name of mordants, for fixing the soluble colouring principles, have, when a solution of them is mixed with a solution of the soluble principles, a tendency to form a precipitate equivalent to the *colouring principle+sub-salt*, and that this precipitate is reduced by sufficient washing to an insoluble compound of *colouring principle, and a base which sometimes performs the function of an acid*, I have been led to inquire whether similar compounds be not formed in the operations of dyeing, either when these organic colouring matters are present with stuffs to which mordants have previously been applied, or when dyed stuffs are submitted to the action of an alkaline solution, as is the practice in dyeing cotton of a Turkish red colour. Experiment has confirmed this inference, for I have ascertained that cotton dyed with colours for which alum is employed, if analysed after average do not present any trace of sulphuric acid.

To this I may add, that if two specimens of red cotton *rosé* by a preparation of tin, which have been sent to me with the assurance of their having been alumed, have really undergone this operation, it will follow, that there is an operation in dyeing, in which a base at first fixed to a colouring principle or to a stuff, may be eliminated by another base which will supply its place, for the two specimens I am treating of, not only do not contain sulphuric acid, but are also devoid, or very nearly devoid, of alumina. This base has been replaced by peroxide of tin.

Finally, these experiments have proved to me: 1st. The influence that matters decidedly alkaline have in accelerating the destruction by atmospheric oxygen of colouring principles of organic origin, soluble in water; 2nd. The acidity of peroxide of tin; 3rd. The tendency of alumina to act as an acid in several combinations, especially in those which it forms with colouring principles; these results appear to me sufficient to explain why these two oxides are so important in dyeing, for fixing combustible colouring matters upon stuffs.

Eighth Division.—Stability of the colour of dyed stuffs, considered in relation to heat, light, water, oxygen, the air, boiling water (debouillis), and re-agents.

The researches that I have undertaken with regard to the stability of the colouring matters fixed by the dyer upon stuffs, have been pursued in conformity with the views enunciated in my "*Considerations générales sur l'analyse organique immédiate.*" (1824.) I have not, according to the general practice, remained satisfied with observing the alterations experienced by stuffs when they are exposed to the air, but I have also, at the same time, noted the modifications experienced by specimens of the same stuffs when placed in a dry vacuum, in the vapour of pure water, in dry hydrogen gas, in dry air, and in air saturated with the vapour of water. My observations, continued during the course of several years, prove the indefinite nature, and even the inaccuracy of the ideas generally received upon the subject; and they furnish an experimental basis for the theory of bleaching by natural agents alone, in which we are absolutely deficient. In short, the conclusion at which I have arrived, agreeably to what I have said in the work already alluded to, is, that the alterations of compounds called organic, that are so often attributed to heat and light, are the result of several causes which act at the same time as those agents. It is my intention shortly to present an especial memoir upon the subject to the Acadamy.

I have applied myself to the discovery of simple means of recognising coloured matters capable of being fixed upon stuffs, because I thought that if the degree of stability of these matters were once determined, trials might be made which would show the composition of matters fixed upon a stuff; the fact being given, whether the colour of the stuff would resist atmospheric agents or not.

Finally. The second part of my course is concluded by an examination of the relations of dyeing to general chemistry and optics.

I venture to hope that the Academy will perceive in the account that I have just sketched of my labours during the ten years that I have been at the Gobelins, the reason of the scarcity of the communications that I have had the honour of submitting to it during that time. Wanting bases, being obliged to establish them myself, and having also to surmount other difficulties of a very different nature, I found it impossible to apply myself to any profound researches, before I had obtained possession, by preliminary and protracted experiments, of the whole of the subject upon which I proposed to treat.

The account which I have just given of the classification of the subjects composing the second part of the course which I deliver at the Gobelins, will enable me to present special memoirs to the Academy, without fearing the reproach of want of coordination, because the order of their successive publication may differ widely from that of their arrangement in the work for which they were undertaken.—*Nouvelles Annales du Muséum D'Histoire Naturelle*, tome iv., p. 409, *et seq.*

ON AN ARTIFICIAL SUBSTANCE RESEMBLING SHELL. BY LEONARD HORNER, ESQ., F. R. S. L. AND ED.: WITH AN ACCOUNT OF THE EXAMINATION OF THE SAME; BY SIR DAVID BREWSTER, K. H., LL. D., F. R. S., &c.— A paper on this subject, of which we subjoin an abstract, was read before the Royal Society on Feb. 25, 1836.

The author, having noticed a singular incrustation on

both the internal and external surfaces of a wooden dash-wheel, used in bleaching, at the cotton factory of Messrs. Finley and Co., at Catrine, in Ayrshire, instituted a minute examination of the properties and composition of this new substance. He describes it as being compact in its texture, of a brown colour, and highly polished surface, with a metallic lustre, and presenting in some parts a beautiful iridescent appearance. When broken, it exhibits a foliated structure. Its obvious resemblance, in all these respects, to many kinds of shell, led the author to inquire into its intimate mechanical structure, and into the circumstances of its formation. He found by chemical analysis, that it was composed of precisely the same ingredients as shell; namely, carbonate of lime and animal matter. The presence of the former was easily accounted for, as the cotton cloths which are placed in the compartments of the wheel in order that they may be thoroughly cleansed by being dashed against its sides, during its rapid revolutions, have been previously steeped and boiled in lime-water. But it was more difficult to ascertain the source of the animal matter; this, however, was at length traced to the small portion of glue, which, in the factory where the cloth had been manufactured, was employed as an ingredient in forming the paste, or dressing, used to smooth and stiffen the warp before it is put into the loom. These two materials, namely, lime and gelatine, being present in the water in a state of extreme division, are deposited very slowly by evaporation; and thus compose a substance which has a remarkable analogy to shell, not only in external appearance, and even pearly lustre, but also in its internal foliated structure, and which likewise exhibits the same optical properties, with respect to double refraction and polarizing powers.

A letter from Sir David Brewster, to whom the author had submitted for examination various specimens of this new substance, is subjoined; giving an account of the result of

his investigations of its mechanical and optical properties. He found that it is composed of laminæ, which are sometimes separated by vacant spaces, and at others, only slightly coherent; though generally adhering to each other with a force greater than that of the laminæ of sulphate of lime, or of mica; but less than those of calcareous spar. When the adhering plates are separated, the internal surfaces are sometimes colourless, especially when these surfaces are corrugated or uneven; but they are almost always covered with an iridescent film of the most brilliant and generally uniform tint, which exhibits all the variety of colours displayed by thin plates, or polarizing laminæ. This substance, like most crystallized bodies, possesses the property of refracting light doubly, and, as in agate and mother-of-pearl, one of the two images is perfectly distinct, while the other contains a considerable portion of nebulous light, varying with the thickness of the plate, and the inclination of the refracted ray. Like calcareous spar, it has one axis of double refraction, which is negative; and it gives, by polarized light, a beautiful system of coloured rings. It belongs to the rhombohedral system, and, as in the *Chaux carbonatée basée* of Haüy, the axis of the rhombohedron, or that of double refraction, is perpendicular to the surface of the thin plates. As mother-of-pearl has, like arragonite, two axes of double refraction; this new substance may be regarded as having the same optical relation to calcareous spar that mother-of-pearl has to arragonite.

The flame of a candle, viewed through a plate of this substance, presents two kinds of images; the one bright and distinct, the other faint and nebulous, and having curvatures, which vary as the inclination of the plate is changed: the two kinds being constituted by oppositely polarized pencils of light. On investigating the cause of these phænomena, Sir David Brewster discovered it to be the imperfect crystallization of the substance; whence the doubly refracting force separates the incident light into

two oppositely polarized pencils, which are not perfectly equal and similar. In this respect, indeed, it resembles agate, mother-of-pearl, and some other substances; but it differs from all other bodies in possessing the extraordinary system of composite crystallization, in which an infinite number of crystals are disseminated equally in every possible azimuth, through a large crystalline plate, having their axes all inclined at the same angle to that of the larger plate, and producing similar phænomena in every direction, and through every portion of the plate: or this remarkable structure may be otherwise described, by saying that the minute elementary crystals form the surfaces of an infinite number of cones, whose axes pass perpendicularly through every part of the larger plate.

An examination of the phænomena of iridescence afforded by this new substance, leads him to the conclusion that the iridescent films are formed at those times when the dash-wheel is at rest, during the night, and that they differ in their nature from the rest of the substance. These phænomena illustrate in a striking manner some analogous appearances of incommunicable colours presented by mother-of-pearl, which had hitherto baffled all previous attempts to explain them; but which now appear to be produced by occasional intermissions in the process by which the material of the shell is secreted and deposited in the progress of its formation.—*Proceedings of the Royal Society.*

Analysis of Raw Silk. By Mr. J. W. Laidlay.—A. A hundred grains of yellow raw silk were digested in moderately strong alcohol, which soon assumed a fine orange tint. At the end of some days, much colour remaining unremoved, heat was applied, and the solution boiled. The alcohol was then decanted, and successive portions of the same solvent were employed, till the silk appeared perfectly decolorized [decolourated]. The solutions were then reduced to a moderate compass by distillation, and

on cooling, deposited a feeble, cloudy precipitate, which subsided slowly. The clear fluid being decanted, and evaporated at a gentle heat, to dryness, left a deep orange brown mass which weighed 0.9 grains. This substance was adhesive, fusible, scarcely, if at all, soluble in water, but readily so in alcohol, to which, in small proportions, it communicated a fine orange tint. A concentrated solution deposits on cooling a vast number of minute shining crystals, which subside to the bottom in the form of a brilliant orange-brown powder. When this precipitation has ceased, the solution lets fall, by spontaneous evaporation, a few filamentous bunches of a white colour, and apparently fatty nature; but in quantity too small for more particular examination.

B. The flocculent precipitate above mentioned, being collected and dried, weighed, 0.1. It had the consistency, fusibility, and other sensible properties of wax.

C. The silk, still perfectly elastic, was now transferred to a deep silver vessel, and boiled with successive portions of distilled water as long as any sensible action was produced. A colourless, opalescent solution was obtained. It was frothy and viscid; and exhibited scarce any tendency to deposit the particles it held in suspension. A solution of bi-chloride of mercury, cautiously dropped from a graduated tube, threw down a bulky coagulum, which, after boiling, became much condensed, and permitted the easy decantation of the clear fluid. This precipitate, well washed and dried, weighed, (deducting 1.4 grains, the amount of metallic salt employed) 8.9 grains. It had all the well known characteristics of albumen.

D. The clear fluid decanted in process C, being evaporated to dryness in a steam-bath left a nearly colourless, transparent, brittle mass, resembling gum. It weighed 13.0 grains, and had a tendency to soften, from the presence of a small quantity of deliquescent salts. It dissolved readily in water, from which neither the bi-chloride nor

tan threw it down. It exhibited no tendency to gelatinize, however concentrated; and was copiously precipitated by sub-acetate of lead.

E. Alcohol now took but a feeble tinge from the silk, which still retained a little harshness. A very dilute solution of caustic potash was accordingly exhibited; and after a few hours digestion, was poured off, exactly neutralized with muriatic acid, and treated with the bi-chloride as in process C. The precipitate of albumen thus obtained weighed 0.4 grains.

F. Finally, the silky fibre, which had now attained its full lustre and flexibility, weighed 76·5; exhibiting a loss of 0·6 upon the total, attributable to hygrometric moisture; the whole of the products being dried at a steam heat immediately before weighment. The following are the results of the analysis:

A. Resinous colouring matter, and white filamentous substance,	0·9
B. Wax,	0·1
C. and E. albumen,	8·9
D. Mucus,	13·0
E. Bleached fibre,	76·5
F. Hygrometric moisture,	0·6
Grains,	100·0

An analysis of white silk gave identical products; and in amount differing only fractionally from the above; except in the particular of the resinous colouring matter, which was indeed present, but in a very much smaller proportion. It is probable that the varieties of colour observable in cocoons, the yellow, the orange, the buff, the white, and the greenish hues, depend only upon the greater or less amount of this resin in the fibre.—*Journal of the Asiatic Society of Bengal*, vol. iv., p. 710.

A. T.

NOTICE OF EXPIRED PATENTS.

(Continued from Vol. v., p. 382.)

Benjamin Thompson, of Ayton Cottage, in the county of Durham, Gentleman, for a method of facilitating the conveyance of carriages along iron and wood rail-ways, tram-ways, and other roads.—Sealed October 24, 1821.

Charles Tubly the elder, of Kenton Street, Brunswick Square, Middlesex, Cabinet Maker, for certain improvements applicable to window-sashes, either single or double hung, fixed or sliding sashes, casements, window-shutters, and window-blinds.—Sealed November 1, 1821.

Samuel Hobday, of Birmingham, Warwickshire, Patent Snuffer Maker, for a method or principle of manufacturing the furniture for umbrellas and parasols, and of uniting the same together.—Sealed November 1, 1821.

John Frederick Archbold, of Serjeants' Inn, Fleet Street, London, Esquire, for a mode of ventilating close carriages.—Sealed November 1, 1821.

Richard Wright, of Mount Row, Kent Road, Surrey, Engineer, for certain improvements in the process of distillation.—Sealed November 9, 1821.

David Redmund, of Agnes Circus, Old Street Road, Middlesex, Engineer, for an improvement in the construction or manufacture of hinges for doors.—Sealed November 9, 1821.

LIST OF NEW PATENTS.

Joseph Bencke Gerothwohl, of Camberwell Grove, in the county of Surrey, Merchant, for certain improvements in filtration. Communicated by a foreigner residing abroad.—Sealed May 28, 1836.—(*Six months.*)

Francis Pettit Smith, of Hendon, in the county of Middlesex, Farmer, for an improved propellor for steam and other vessels.—Sealed May 31, 1836.—(*Six months.*)

William Gossage, of Stoke Prior, in the county of Worcester, for certain improvements in the apparatus or means used for evaporating water from saline solu-

tions, and in the construction of stoves for drying salts.—Sealed June 2, 1836.—(*Six months.*)

Luke Hebert, of Paternoster Row, in the city of London, Patent Agent, for certain improved machinery, and processes for economising and purifying the manufacture of bread, a part of which is applicable to other purposes.—Sealed June 2, 1836.—(*Six months.*)

Baron Henry De Bode, Major General, in the Russia service, of Edgware Road, in the county of Middlesex, for improvements in capstans.—Sealed June 4, 1836.—(*Six months.*)

Manoah Bower, of Birmingham, in the county of Warwick, for improvements applicable to various descriptions of carriages.—Sealed June 7, 1836.—(*Six months.*)

John Young, of Wolverhampton, in the county of Stafford, Patent Lock Smith, for certain improvements in the making or manufacturing of metal hinges for doors and other purposes.—Sealed June 7, 1836.—(*Six months.*)

Daniel Chambers, of Carey Street, Lincoln's Inn, Water Closet Manufacturer, and Joseph Hall, of Margaret Street, Cavendish Square, Plumber, for an improvement in pumps.—Sealed June 7, 1836.—(*Six months.*)

Miles Berry, of Chancery Lane, Holborn, in the county of Middlesex, Mechanical Draftsman, for certain improvements in machinery or apparatus for cleaning, purifying, and drying wheat or other grain or seeds. Communicated by a foreigner residing abroad.—Sealed June 7, 1836.—(*Six months.*)

Amos Gerald Hull, of Cockspur Street, Charing Cross, in the county of Middesex, Esquire, for certain improvements in instruments for supporting the prolapsed uterus.—Sealed June 7, 1836.—(*Six months.*)

Edward Massey, of King Street, Clerkenwell, in the county of Middlesex, Watch Maker, for certain improvements in the apparatus used for measuring the progress

of vessels through the water, and for taking soundings at sea.—Sealed June 13, 1836.—(*Six months.*)

Jacob Perkins, of Fleet Street, in the city of London, Civil Engineer, for improvements in apparatus for cooking.—Sealed June 13, 1836.—(*Six months.*)

Miles Berry, of Chancery Lane, in the county of Middlesex, Civil Engineer, for improved apparatus for torrefying, baking, and roasting vegetable substances, which, with certain modifications and additions, is also applicable to the evaporation and concentration of saccharine juices and other liquids. Communicated by a foreigner residing abroad.—Sealed June 13, 1836.—(*Six months.*)

Alexander Ritchie, of Leeds, in the county of York, Merchant, for a certain improvement in dressing and finishing woollen cloths and other woven fabrics. Communicated by a foreigner residing abroad.—Sealed June 13, 1836.—(*Six months.*)

Charles Schafhautl, of Dudley, in the county of Worcester, Gentleman, for certain improved apparatus for puddling iron.—Sealed June 13, 1836.—(*Six months.*)

Thomas Vaux, of Woodford Bridge, in the parish of Woodford, in the county of Essex, Land Surveyor, for a certain mode of constructing and applying a revolving arrow for agricultural purposes.—Sealed June 13, 1836.—(*Six months.*)

John White, of the town and county of Southampton, Engineer, for certain improvements on rotary steam engines, which improvements or parts thereof are applito other useful purposes.—Sealed June 15, 1836.—(*Six months.*)

James Dredge, of the parish of Walcot, in the city of Bath, and county of Somerset, for certain improvements in the construction of suspension chains for bridges, viaducts, aqueducts, and other purposes, and in the construction of such bridges, viaducts, or aqueducts.—Sealed June 17, 1836.—(*Six months.*)

John Hopkins, of Exmouth Street, Clerkenwell, in the county of Middlesex, Surveyor, for improvements in furnaces for steam-engines, boilers, and other purposes.—Sealed June 18, 1836.—(*Six months.*)

Lewis Gachet, of Cambridge Heath, in the county of Middlesex, Gentleman, for improvements in machinery for manufacturing and producing velvets and certain other fabrics.—Sealed June 18, 1836.—(*Six months.*)

Joseph Bunnett, of Newington Causeway, in the borough of Southwark, Window Blind Maker, for certain improvements in window-shutters, which improvements may also be applied to other useful purposes.—Sealed June 18, 1836.—(*Six months.*)

William Watson, of Liverpool, in the county Palatine of Lancaster, Merchant, for certain improvements in the manufacturing of sugars from beet-root and other substances. Communicated by a foreigner residing abroad.—Sealed June 18, 1836.—(*Six months.*)

John Young, of Wolverhampton, in the county of Stafford, Patent Lock Smith, for certain improvements in manufacturing boxes and pulleys for window-sashes and other purposes. — Sealed June 21, 1836.—(*Six months.*)

Robert Smith, of Manchester, in the county of Lancaster, Engineer, for certain improvements in the means of connecting metallic plates for the construction of boilers and other purposes.—Sealed June 22, 1836.—(*Six months.*)

William Wright, of Salford, in the county of Lancaster, Machine Maker, for certain improvements in twisting machinery used in the preparation, spinning, or twisting of cotton, flax, silk, wool, hemp, and other fibrous substances.—Sealed June 22, 1836.—(*Six months.*)

Charles Pearce Chapman, of Cornhill, in the city of London, Zinc Manufacturer, for improvements in printing silks, calicoes, and other fabrics.—Sealed June 22, 1836.—(*Six months.*)

William Barnett, of Brighton, in the county of Sussex, Founder, for certain improvements in apparatus for generating and purifying gas for the purposes of illumination.—Sealed June 22, 1836.—(*Six months.*)

Hamer Stansfeld, of Leeds, in the county of York, Merchant, for improvements in machinery for preparing certain threads or yarns, and for weaving certain fabrics.—Sealed June 22, 1836.—(*Six months.*)

John Woolrich, of Birmingham, in the county of Warwick, Professor of Chemistry in the Royal School of Medicine, at Birmingham, for certain improvements in producing or making the substance commonly called or known by the name of carbonate of baryta, or carbonate of barytes.—Sealed June 22, 1836.—(*Six months.*)

Henry Dunnington, of Nottingham, Lace Manufacturer, for certain improvements in making or manufacturing lace.—Sealed June 22, 1836.—(*Six months.*)

John McDowell, of Johnstone, in the county of Renfrew, North Britain, and of Manchester, in the county of Lancaster, Engineer, for certain improvements in the machinery for sawing timber, and in the mode of applying power to the same.—Sealed June 24, 1836.—(*Six months.*)

George Richards Elkington, of Birmingham, in the county of Warwick, Gilt Toy Maker, for an improved method of gilding copper, brass, and other metals or alloy of metals.—Sealed June 24, 1836.—(*Six months.*)

Samuel Hall, of Basford, in the county of Nottingham, Gentleman, for improvements in propelling vessels, also improvements in steam-engines, and in the method or methods of working some parts thereof, some of which improvements are applicable to other useful purposes.—Sealed June 24, 1836.—(*Six months.*)

Alexander Stocker, of Birmingham, in the county of Warwick, Gentleman, for improvements in machinery for making files.—Sealed June 25, 1836.—(*Six months.*)

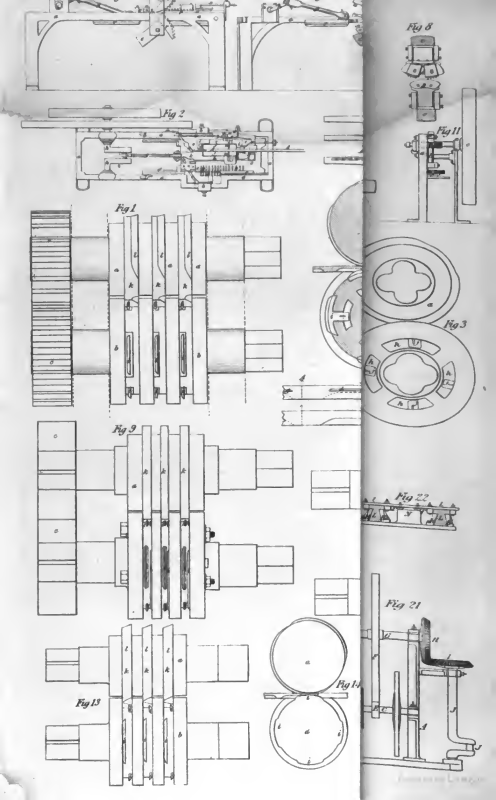


Fig 8
Fig 2
Fig 11
Fig 1
Fig 3
Fig 9
Fig 22
Fig 21
Fig 13
Fig 14

THE

REPERTORY

OF

PATENT INVENTIONS.

No. XXXII. NEW SERIES.—AUGUST, 1836.

Specification of the Patent granted to ALEXANDER STOCKER, *of Yovel in the County of Somerset, Gentleman, for Improvements in Machinery for Manufacturing Horse-Shoes and certain other Articles.*— Sealed April 14, 1835.

WITH AN ENGRAVING.

To all to whom these presents shall come, &c. &c.,— *Now know ye*, that, in compliance with the said proviso, I, the said Alexander Stocker, do hereby declare the nature of my said invention, and the manner in which the same is to be performed are fully described and ascertained in and by the following description thereof, reference being had to the drawings hereunto annexed, and to the figures and letters marked thereon (that is to say):—

My invention consists, first, in improvements in preparing the iron for making horse-shoes, and also for making shoes for mules and asses, by means of rollers, as hereafter described; secondly, in improvements on machinery for bending prepared iron into shoes for horses, and also for mules and asses.

Description of the Drawings.

Fig. 1, represents a pair of rollers constructed according to my invention.

Fig. 2, is a transverse section.

Fig. 3, is an end view of the same, and

Fig. 4, is a longitudinal section of the lower roller.

I have not thought it necessary to shew the framing necessary to carry these rollers, such framing being similar to that usually employed for ordinary rollers for rolling iron. *a*, is the upper roller, and *b*, the under roller. *c*, *c*, are pinions on the axis of the rollers, *a* and *b*, for the purpose of causing them to revolve correctly together. In constructing horse-shoes, as well as shoes for asses, and mules, it is usual to form grooves or recesses for the reception of the heads of the nails.

Fig. 5, shows a horse-shoe having the grooves or recesses, *d*, *d*, formed, one on each side of the shoe, and near to the outer edges thereof. These groves, *d*, *d*, like those produced in making shoes by hand, do not proceed all round the shoe, but there are spaces, *e*, *e*, for the heel, and the space, *f*, at the front part of the shoe of the thickness of the bar. The object of the first part of my invention, is the use of rollers, so constructed that they will produce bars of iron having such grooves, *d*, *d*, and spaces, *e*, *e*, and *f*, at proper intervals, whereby such bars when divided into suitable lengths, each such length will contain parts grooved and parts ungrooved, proper to make a shoe, such as is shewn at fig. 5. In addition to the grooves, *d*, *d*, some description of shoes are made with a bevelled edge on the side which comes against the foot, such as at *g*, in fig. 6. In order to produce bars of iron, the two sides of which resemble those shewn at figs. 7 and 8, I construct rollers in the following manner: *h*, *h*, are longitudinal openings or hollow spaces from end to end of the roller, *b*. It will be seen by the various figures that the roller, *b*, has three grooves, each to receive a bar

of iron, whilst the roller, *a*, has three projecting rims, which enter into, and work within, the grooves formed in the roller, *b*. In each of the grooves formed in the roller, *b*, are formed openings to receive the moulds, *i*, *i*, such moulds being accurately fitted to the openings in the grooves of the roller, and such moulds are retained in their places by having tail pieces affixed thereto, which have keys or wedges, *j*, passed through them, as is clearly shewn by the various figures in the drawing. The object of these moulds is to produce the grooves, *d*, *d*, at proper intervals. On the projecting rings, *k*, of the roller, *a*, are formed projecting surfaces, *l*, in order to produce the bevelled edge, as shewn at *g*, in fig. 6.

Having thus described a pair of rollers suitable for preparing bars of iron having the two sides similar to those shewn at figs. 7 and 8, I would remark that on the size of the shoes will depend the size of the rollers, and also the distances at which the moulds, *i*, *i*, are apart; these will readily be apportioned by a mechanic, after a careful examination of this description, together with the foregoing figures in the drawing, and it will be evident that rollers capable of producing similar effect may be constructed in various ways; I do not, therefore, confine my invention to the use of rollers constructed precisely in the manner here shewn, but intend to avail myself of such variations as will suit the varied forms of shoes desired; always keeping in mind the chief property of my invention, that of rollers capable of producing bars of iron for making horse, ass, and mules' shoes, having the grooves, *d*, *d*, and the impressions, *g*, formed thereon at proper intervals, and without such grooves, *d*, *d*, or impressions, *g*, continuing, without interruption, throughout the bar.

Fig. 9, shews another construction of rollers, fig. 10 being a transverse section; fig. 11, a longitudinal section; and fig. 12, an end view of the same. In this instance, however, the projecting rings, *k*, on the upper roller, *a*, are plain, and consequently produce a plain surface to

that part of the shoe which comes against the foot. The moulds, *i*, *i*, for making the grooves, *d*, *d*, are similar to those before described, but are affixed by dovetail grooves in the circular plates, *l*; for it will be seen by this drawing, the roller, *b*, in this instance, is made up of a series of plates, *l*, *l*, and *m*, *m*, which are securely retained together by the screw-bolts, *n*, and they are prevented turning on their axis by the keys, *o*, *o*, all which will be very evident on inspecting the drawing; and it will, at the same time, be observed, that, in this instance, the impression or bevelled edge, *g*, is produced on the same side of the bar as that on which the grooves, *d*, *d*, are formed. In this instance, as in the former case, the rollers will produce such grooves and such impressions or bevels at suitable intervals, in order that the bar, when divided, each division shall be proper for making a shoe with the requisite grooves, *d*, *d*, in their proper places, also the spaces, *e*, *e*, and *f*, and also the bevelled edge, *g*.

Fig. 13, represents another pair of rollers.

Fig. 14, is a transverse section.

Fig. 15, is an end view, and

Fig. 16, is a longitudinal section of the lower roller. The construction of these rollers differs from those before described, inasmuch as they are solid metal; the moulds, *i*, *i*, for producing the grooves, *d*, *d*, being formed in the act of making the rollers, and constitute part thereof, the metal being removed between the moulds, *i*, *i*, in order to omit grooving the bars of iron at those places or spaces which are to form the heels and front of the shoe. It will also be seen that the bevelled portion, *g*, of the side of the shoe which comes against the foot is, throughout, the width of the shoe, as is clearly shewn by fig. 17; and fig. 18, shows the other side of the bar of iron, having the grooves, *d*, *d*, formed thereon, and also the plain surfaces, *e*, *e*, and *f*, *f*. From the foregoing description of the rollers used to produce the object of my invention, a workman will readily be able to arrange or construct

rollers to produce bars of iron suitable for making shoes for horses, asses, and mules, according to the various sizes and patterns desired for the market.

I will now describe the second part of my invention.

Fig. 19, represents a side elevation of a machine for bending iron into the form of shoes.

Fig. 20, is a plan of the same.

Fig. 21, is a back view, and

Fig. 22, is an end view of a part of a machine.

In these figures the same letters are used to indicate the same parts, A, being the framing of the machine, its arrangement and construction will be evident on inspecting the various figures in the drawing. B, is the bed-plate. C, is the main or driving-shaft, which, receiving motion by the pulley or drum, D, transmits the same to various parts of the machine by the pinion, E, taking into and driving the cog-wheel, F, which is affixed to the shaft, G, which turns in suitable bearings in the framing of the machine; on the shaft, G, are affixed to the bevelled toothed wheels, H, one at each end, which wheels, H, take into and drive the bevelled toothed wheels, I, affixed on the crank-shafts, J, J, which crank-shafts have suitable bearings affixed to the side-framings, A, of the machine, as is clearly shewn in the drawings. On to the bed, B, are affixed guides, K, inclining to each other, in order that the compressing instruments, L, which slide therein, may approach each other, as they are driven outwards by the connecting rods, M, which are actuated by the cranks, J, J, as will readily be understood by inspecting the various figures of the drawing; and it will be seen that the connecting rods, M, have the means of adjustment in their length, by screws and nuts, as is well understood; N, is a table or plate of metal affixed on the bed, B, of the machine. O, O, are two guides between which the length of iron (heated in preference) to form the shoe is laid, as shewn by dotted lines, at the time that the compressing instruments, L, are drawn back. The com-

pressing instruments are connected to the rods, L, by pin joints, as shewn in the drawing, thus allowing of movement, to accommodate the rods to the working of the cranks, J, J. On the upper part of the sliding portion of the compressing instruments, there are plates, *l*, *l*, having slots to allow of adjustment; these plates, *l*, *l*, being securely held down by screw-bolts and nuts. The plates, *l*, *l*, have rollers, P, P, turning on axes; these rollers are driven along the length of iron, and cause it to bend round the die, or mould, Q, as will be readily understood by examining the plan fig. 20. The mould or die, Q, is capable of rising in order to remove the shoe in like manner to similar dies or moulds used for what are termed heels, and shoe-tips, as is well understood: the horse, ass, and mule shoes, being thus prepared, are to have holes punched as usual; and are to be fitted to the particular feet by hammering as heretofore: and it may be further remarked that where additional thickness of metal is required, at the front and heel, in addition to leaving those parts ungrooved, as is mostly the case with shoes for the hind feet, this may be effected by sinking those portions of the rollers, from the correct circle, whereby such additional thickness may be produced.

Having thus described the nature of my invention, and the manner of combining the various parts, I would remark that I do not claim any of such parts in their separate condition, nor in combination other than is hereafter more distinctly pointed out and claimed; and I would remark that I am aware that iron has before been prepared by means of rollers, for making horse-shoes, the grooves of which run continuously along the bar or lengths of metal.—I do not therefore lay claim to the use of rollers generally, for preparing iron for horses, ass, and mules shoes; but I do declare that I confine my claim of invention, first, to the preparing iron for horse, ass, and mule shoes by means of rollers with the grooves, *d*, *d*, produced at proper intervals; having spaces, *e*, and

f, left ungrooved as above described, and having the bevelled edges, *g*, *g*, produced at proper intervals as above described. Secondly, I claim the mode of working the two compressing instruments within guides, which stand at an angle to each other, whereby such compressing instruments approach each other as they are forced outwards by the connecting rods as above described.—In witness whereof, &c.

Enrolled October 14, 1835.

Specification of the Patent granted to THOMAS JEVONS, *of Liverpool, in the County of Lancaster, Merchant, for certain improved Machinery to be used in manufacturing bar or wrought Iron into Shoes for Horses, and also into Shapes for other purposes.*—Sealed October 8, 1835.

WITH AN ENGRAVING.

To all to whom these presents shall come, &c. &c.,—*Now know ye*, that in compliance with the said proviso, I, the said Thomas Jevons, do hereby declare that the said invention is fully and without reserve made known and described in and by the following specification thereof, reference being had to the drawings hereto annexed (that is to say):—

My invention of certain improved machinery to be used in manufacturing bar or wrought iron into shoes for horses, and also into shapes for other purposes, consists in the construction and employment of three distinct machines for effecting in consecutive succession the several parts of the operations of cutting, stamping, and forming the shoe from a bar of red-hot iron. The first machine receives the bar of heated iron which has been previously rolled to the desired width and thickness, and after cutting off the proper length to constitute one shoe, spreads the middle of the piece between a pair of

rolling segmental swages, and then lets it fall upon an inclined plane which conducts it toward the second machine. The workman then takes up the prepared piece of iron, still red hot and of a straight form, and by a pair of tongs introduces it into the second machine, where by the action of a pair of rolling segment dies, the grooves and also the recesses for the nail holes are indented in the face of the straight piece. From this machine the prepared and indented piece of iron, still in a straight form, is conducted in a similar manner to the third machine, and is then, by the workmen attending, introduced between a pair of eccentric cam rollers which bends the piece (still in a red-hot state) into the curved form of a horse-shoe or other desired shape.

Description of the Drawing.

Fig. 1, represents a side elevation of the first mentioned machine.

Fig. 2, is a horizontal view of the same, some of the upper parts of the machine being removed to shew the other operating parts more clearly.

Fig. 3, is a sectional elevation taken longitudinally through about the middle of the machine; and

Fig. 4, is a sectional elevation taken transversely at right angles to the former, through the machine in front of the swaging segments. The several letters of reference indicate the same parts of the machine in these four figures. *a, a, a, a,* is a rectangular frame standing horizontally upon legs, and supporting the working parts of the machinery; *b, b,* are two side-standards fixed to the frame in which two tumbler frames, *c, c,* vibrate upon centres. These tumbler frames move simultaneously, carrying a pair of segment cams, *d, d,* which I call the swaging rollers, as between the peripheries of these cams the heated iron is passed in order to be compressed. A sliding carriage, *e, e, e,* is supported upon horizontal ledges, *f, f,* fixed to the inner sides of the frame, *a,* which

carriage is moved to and fro by a crank rod, *g*, connected to the main driving shaft, *h*. Upon the horizontal sliding carriage, *l*, a pair of cheeks, *j*, *j*, are mounted in jaws, *i* and *k*, the one, *i*, is firmly fixed to the carriage, the other *k*, is moveable as a lever upon a pivot, at *l*, set into the carriage; in the moving jaw, *k*, one of a pair of cutters, *m*, *m*, is fixed, the other corresponding cutter, *m*, is mounted in a lever, *n*, turning upon a fulcrum pin, at o, and when the heated rod of iron has been introduced into the machine at, A, A, the closing of these cutters, *m*, *m*, sever that portion of the length of the bar of iron which will be required to form one horse-shoe; at the same time the jaw, *k*, closing, the piece of iron becomes confined laterally between the cheeks, I, I, and the segment cams, *d*, *d*, rolling, conduct the piece through, compressing and expanding its parts to the breadth and thickness of the required shoe, which constitutes the first part of the operation of making the shoe; on the upper surface of the sliding carriage, *e*, a horizontal rack, *p*, *p*, is formed, which takes into a tooth sector, *q*, affixed to the upper tumbling frame, C. This upper toothed sector, *q*, is made sufficiently wide to take into, not only the rack, *p*, but also into another toothed sector, *r*, affixed to the lower tumbling shaft; hence it will be perceived that by the reciprocating sliding movements of the carriage, *e*, worked to and fro by the crank rod, *g*, the rack, *p*, will, through the agency of the tooth sectors, *q* and *r*, cause the tumbling frames with the segment cams, *d*, *d*, to perform oscillating movements: the general construction of the machine being now understood I proceed to explain its details, and the manner in which it effects the desired object of cutting off the portion of iron from the rod, and compressing and expanding it. The required driving power being applied to the crank shaft, *h*, the carriage, *e*, *e*, will be slidden to and fro, upon its ledges, by the crank rod, *g*, and the segment cams, *d*, *d*, will be made to reciprocate by the rack and

toothed sectors; the parts being situate as shewn in fig. 3, the heated bar of iron is now to be introduced into the machine, as represented at, A, guided by a rest, s, affixed to the front of the frame. The bar being pushed onward until its end comes against a stop piece, *t*, the carriage, *e*, *e*, in advancing, causes the back of the jaw, *k*, (see fig. 2) to be acted upon by the end of the wedge lever, *v*, the reverse end of which lever is brought in contact with a stop, *u*, as the carriage proceeds, and the lever being moved into a position at right angles to the back of the jaw, is made to push it forward by its wedge-like action, and the cheeks, *j*, *j*, are thereby closed, and made to confine the bar of iron between them; by the same forward movement of the carriage, an inclined plane at the back of the lever, *n*, is brought against an inclined stud, *w*, which forces the lever, *n*, forward, and with it, the cutter, *m*; by these means the two cutters, *m*, *m*, are brought together, as shewn by dots in fig. 2, and the bar of iron, A, being between them, is severed, leaving the piece of iron which is to form one horse-shoe between the cheeks, *j*, *j*. The further rotary movement of the crank-shaft, now slides the carriage, *e*, backward, and in so doing causes the rack, *p*, to give the rolling action of the tumbling frames, *c*, *c*, and to the segment cams, *d*, *d*, which in rolling compress and expand the parts of the piece of iron to the required shape, as shewn in different views at fig. 5. It must be here observed that in order to give the proper figure to the piece of iron, one of the cheeks, *j*, must be slightly curved, and also that the swaging cams, *d*, *d*, must be made in a slight degree eccentric and bevelled, so as to render the piece thinner in the middle, and on the edge intended to form the inner part of the shoe, and leaving the heel parts thick. Of course these may be varied to suit taste or circumstances, and for the purpose of producing other forms. At the commencement of the retrogade movement of the carriage, *e*, a pin, *y*, set in the upper surface of the lever,

n, works against the side of a bar, *z*, *z*, and when this pin, *y*, comes against the inclined plane, 1, on the side of the bar, the lever, *n*, with the cutter, *m*, is forced back and brought into the situation shewn in fig. 2, which opening of the cutters makes way for the rolling swages; the further retrogade movement of the carriage, *e*, causes the tail of the wedge lever, *b*, to come in contact with the stop, 2, fixed on the side frame, which throws the lever into the oblique position, and allows the jaw, *k*, to open. On the carriage, *e*, proceeding a little further in its retrograde movement, the tail of the lever, *x*, comes in contact with another stop, 3, fixed on the opposite side of the frame, which stop brings the lever into a position at right angles to the carriage, and causes it to force back the moving jaw, *k*, which releases the piece of iron from between the cheeks, *j*, *j*, and allows it to fall through, into an inclined plane placed beneath the machine, by means of which the piece is conveniently conducted toward the workman, who instantly places it in the second machine, where it is to be stamped, that is, the grooves and nail-holes formed. The construction of the second machine is the same in most of its operating parts as that already described; the piece of iron is put into the machine in the same situation as the red-hot bar was first introduced, and the piece is passed between segment rollers, in the same manner, but in this machine the segment rollers, are dies, by means of which the grooves and recesses for the nail-holes are formed.

Fig. 6, is a horizontal view of the second machine, partly in section as fig. 2. The upper tumbling frame, *c*, the tooth sector, *q*, and upper segment die, being removed, to shew the other working parts more clearly. A narrow bar, 4, extends horizontally about half-way between the cheeks, *j*, *j*, in the jaws, I, *k*. This bar is fixed to the front of the frame, A, and upon it, between the cheeks, the piece of hot iron, prepared in the former

L 2

machine is to be placed; in order to bring this piece of iron into a situation for the rolling dies to act properly upon it, a projector, 5, is made to slide horizontally on the upper surface of the bar, 4. This projector is attached to one end of a double armed lever, 6, 6, turning horizontally upon a fulcrum pin, fixed in the front part of the frame, *a*. Now as the carriage, *e*, *e*, advances, one end of a right angled lever, 7, 7, mounted in a bracket arm, 8, extending from the carriage, comes in contact with the outer end of the double armed lever, 6, which causes the projector, 5, to push the piece of iron into the proper situation between the cheeks, and when the projector has moved sufficiently far, it is withdrawn by the force of a spring, 9, acting upon the double armed lever, 6, the right angled lever, 7, having been withdrawn from the end of the lever, 6, by an adjustable stop, 10, fixed at the side of the frame. The receding of the carriages, *e*, *e*, now causes the rolling dies to act upon the piece of heated iron, as it passes between them, but in this instance its figure is not altered, the upper rolling die simply impressing the surface of the piece of iron, and forming the grooves and recesses for the nail holes, as shewn in fig. 7, which represents the piece in the second stage of the operation of making a horse-shoe. The further receding of the carriage, *e*, *e*, brings the levers against the stops, as described in reference to fig. 2, by which the jaw, *k*, is opened, and the piece of iron let fall on to an inclined plane ready to be taken and introduced into the third machine.

Fig. 8, shews the pair of rolling dies mounted in the tumbling frames, as they would appear on the reverse side to fig. 3. The edges of the dies are levelled to form the grooves in the horse-shoe, and these are made with projecting studs, or points, which produce the impressions for the nail-holes; it is scarcely necessary to say that these dies are adjustable by screws shewn in the last described figure. The machine for effecting the

third part of the operation, that is, bending the piece of iron into the form of a horse-shoe, is shewn in side elevation at fig. 9, in horizontal view at fig. 10, and in front elevation at fig. 11; *a, a, a*, is the frame-work in which are mounted two spindles or vertical shafts, *b*, and *c*; upon the end of a horizontal shaft, *d*, a pulley, *e*, is fixed round which a driving strap is to be passed communicating with the steam-engine or other first mover: a horizontal sliding bar, *f*, is mounted in grooved brackets at the back of the frame, on the face of which bar a rack, or row of teeth, *g*, *g*, is formed; upon the vertical shaft, *b*, a toothed wheel, *h*, is mounted, which takes into the rack, *g*, of the sliding bar. At the back of the frame-work a branch rod, *i*, *i*, is connected at one end to the sliding rack bar, by a joint, *k*, and at the other end to a crank, *l*, on the back end of the driving shaft.

Fig. 12, is a horizontal section of the vertical shafts, *b*, and *c*, with the eccentric gear, *m*, and *n*, affixed to the lower parts of those shafts. At the bottom of the shaft, *b*, the block, *o*, for forming the shoe, is affixed, and at the bottom of the other shaft, *c*, the cam or follower, *p*, is attached, and also the plate, *q*, intended to operate as a guider in the act of bending the piece of iron round the block.

Fig. 13, is a horizontal view of the lower ends of the spindles, *v*, and *c*, with the block, *o*, and following cam, *p*, their reverse or under sides being represented upwards. The piece of iron prepared as above described is to be introduced into this machine in front as shewn at, A*, in figs. 12 and 13. A small nipper lever, *r*, turns upon a pin set in the bent arm, *s*, extending from the back of the block, which nipper lever on the opening of the cams, (that is the block and follower) to receive the piece of iron to be bent, is brought into the position shewn in figs. 12 and 13, taking hold of the end of the piece of iron and keeping it firmly against the block; rotary motion being now given to the spindle, *b*, by the sliding

rack bar, *f*, actuated by the crank, *l*, as described above, the eccentric gear, *m*, and *n*, of the two spindles, *b*, and *c*, with the block, *o*, and follower, *p*, will revolve together, and cause the piece of iron, A*, to be bent round to the shape of the block, *o*, which finishes the operation of forming the horse-shoe.

Fig. 14, on the nipper lever, *r*, coming round, it will strike against the end of a curved form, *t*, attached to the block of the follower, which will now open the nipper lever, and allow the shoe to fall down from the machine. —In witness whereof, &c.

Enrolled April 8, 1836.

Specification of the Patent granted to John Cooper Douglas, *of Great Ormond Street, in the County of Middlesex, Esquire, for certain Improvements which prevent either the Explosion or the Collapse of Steam and other Boilers from an excess of external or internal pressure.*—Sealed November 19, 1834.

WITH AN ENGRAVING.

To all to whom these presents shall come, &c. &c.— *Now know ye*, that in compliance with the said proviso, I, the said John Cooper Douglas, do hereby declare that the nature of my said invention, and the manner in which the same is to be known and performed, are particularly described and ascertained in and by the following description thereof, reference being had to the drawing hereunto annexed, and to the figures and letters marked thereon, (that is to say):—

My invention consists of a piston moved by the elasticity of the steam by means of which the common arrangement of a safety-valve may be rendered more certain in its operation; and my invention also consists of a pneumatic or hydraulic apparatus, or both. On the draw-

ing hereunto annexed these provisions for safety are exhibited.

Description of the Drawing.

Fig. 1, is the side elevation of a boiler wherewith it is intended to generate and employ low pressure steam, with my improvements attached and adapted thereto; part of this boiler is represented open or enclosed in order that my said improvements may be more distinctly exhibited by the drawing.

Fig. 2, is the end of a boiler wherewith it is intended to generate and employ steam of a high pressure, with part of my improvements attached thereto.

Fig. 3, is also the end of a high pressure steam-boiler, with that part of my improvements shewn in fig. 2, attached to it. This last arrangement fig. 3, being merely exhibited here to shew how the situation of the bell, B, and valve C, may be altered for purposes of convenience. My improvements may be said to consist of two distinct arrangements for insuring safety to boilers, generators, caldrons, stills, or other vessels subject to changes of pressure, whether external or internal, by increase or decrease of temperature of otherwise. When I wish to guard such vessels against too great an increase of internal pressure, I apply my improvements shewn at, A, (fig. 1,) in such manner that they shall insure the opening of a safety-valve of the usual description, by acting upon the lever or other part of the usual safety-valve arrangement shewn at, B (fig. 1). I construct a small cylinder above the point, A, or other convenient part of my said vessel, and fit into the cylinder a piston. As the piston rod, C, (fig. 1,) rises or falls in the small cylinder by the increase or decrease of pressure within the vessel, it is made to operate upon the chains, D, E, (fig. 1). Connected with the chain, E, will be seen a small steelyard, spring balance, or other well-known indicator of pressure, G, suspended from the fixed bracket, F. When the piston

rod, C, ascends this chain, E, is acted upon, and the index hand of the spring balance, G, will (in this particular arrangement) be seen to have moved downwards. When the piston rod, C, descends, the pull upon the chain, E, is lessened, and the index hand of the spring balance, G, will (in this particular arrangement) be moved upwards. I have said that the chain, D, is operated upon by the rise and fall of the piston rod, C. One end of the chain, D, is passed through a hole in the end of the safety-valve lever at, T, in such manner that it shall have a little play without disturbing the safety-valve by every fluctuation and variation of pressure which may affect the piston rod, C, and the indicator, G. But if the pressure should continue to increase and should the safety-valve at, B, not blow itself open, the ascending motion of the piston rod, C, will very soon cause the chain, D, to pull upon the safety-valve lever and cause (or contribute to cause) the opening of the safety-valve. My improvements described above, or modifications of them, I consider applicable as the means of greater safety, where the causes of boilers or other vessels bursting are such as are generally acknowledged. But as I have from long experience and observation been led to believe that some explosions are attributable to other causes, I have provided for such peculiar causes by the apparatus shewn on fig. 1, H, I, K, L, M, N, and O, for low pressure boilers or other vessels. And by the apparatus shewn on fig. 2, P, Q, or by the apparatus shewn on fig. 3, R, S, for high pressure boilers or other vessels. These latter cases of explosion I attribute to the water or other liquid being raised up from the bottom of the boiler, by the rapid formation of elastic vapour which cannot with sufficient rapidity pass up through to the surface of the liquid; such an elastic vapour being a bad conductor of heat becomes more highly charged with heat, and with the more power repels and drives upwards the liquid, forcing the steam off by the valve, and sometimes the water also. When in such

cases the valve is shut, the deflected forces cause a showering of the upper and cooler liquid amongst the lower or hotter elastic vapour, by which this hotter elastic vapour is condensed or partially condensed, and the pressure is thus suddenly reduced below the pressure of the atmosphere. I therefore provide the low pressure boiler with a supply of water ready to rush in below when this reduction of pressure takes place in the inside, as at fig. 1, and I provide the high pressure boiler with a supply of atmospheric air to rush in as at figs. 2 and 3. In low pressure boilers I use the arrangement of cisterns (fig. 1), when the internal pressure is too little, and a collapse likely to happen, the hanging valve, K, will be pressed open by atmospheric pressure and water from the cistern, No. 1, will flow into the boiler along, K, I, H. For keeping No. 1, well supplied with water, I use the common float apparatus, L, M, by which means water is permitted to flow down, N, from No. 2, when required in No. 1. In some situations, and particularly in steam-boats, a mere pipe and valve, O, from the bottom of the boiler into the water will answer the same purpose for either high or low pressure, and may then be better than the cisterns No. 1 and No. 2. In high pressure boilers I prefer using the arrangement of a pipe and valve with signal bell, shewn in fig. 2, and air is pressed in through the valve, Q, and through the pipe, P, when necessary to prevent a collapse. The signal bell, W, is intended to warn the engineer that such change has taken place. In some situations I prefer the air-pipe valve and bell to be arranged as on fig. 3, at R, S, X. I have now described my certain improvements which prevent either the explosion or collapse of steam and other boilers from an excess of external or internal pressure, with reference to the annexed drawing, in such manner, as to enable persons conversant with works of a similar nature to practise the invention, and I do hereby declare that I do not claim as my invention the use of a steel-yard, spring balance, or other meter of pressure.

But I claim as my invention that construction and arrangement of a piston and cylinder (more particularly above described) whereby the increase or decrease of pressure within a vessel may be availed of, for moving any of the numerous forms of safety-valves in use. I do not limit my claim to any arrangement of connecting chains, connecting rods, or other connection or connections between the said piston, and the said safety-valve or safety-valves, and I do not limit my claim to any kind of boiler or boilers. Further, I do not claim as my invention the use of valves opening inwards, and which have been extensively introduced in this country for some years for greater security to boilers when they are cooling. My claim is for the construction, application, and use of such valves and tubes opening inwards at the bottom of boilers (whatever be the position of such apparatus and valves) for the purpose of counteracting the effects of those particular changes (more distinctly above described), which I have observed to go on more or less in all boilers. And I do not limit my claim to that form and construction of the apparatus which I have thought it advisable to describe above.—In witness whereof, &c.

Enrolled May 19, 1834.

Specification of the Patent granted to Stephen Perry, *of Wilmington Street, Wilmington Square, Gentleman,* Edward Massey, Sen., *of King Street, Clerkenwell, Watch Manufacturer, and* Paul Joseph Gauci, *of North Crescent, Beford Square, Artist, all in the County of Middlesex, for certain Improvements in Pens and Penholders.*—Sealed September 20, 1834.

WITH AN ENGRAVING.

To all to whom these presents shall come, &c. &c.,—*Now know ye* that in compliance with the said proviso, we, the said Stephen Perry, Edward Massey, and Paul

Joseph Gauci, do hereby declare the nature of our said invention as regards pens, to consist in the following improvements (that is to say) :—

First, in a new additional side cut or cuts, slit or slits, which give great additional elasticity, or as we technically call it, relief to the pen, for inasmuch as all metal pens are subject to a certain degree of rigidity, the object of the manufacturers should always be to relieve them as much as possible from that quality. Secondly, in an adjustable or sliding spring, acting downwards, but not laterally upon the nibs, and increasing or diminishing the resistance and consequent hardness of the pen according as the said spring is advanced towards, or caused to recede, from the point of the pen. Thirdly, in so forming the pen as to leave a spring from the upper side of which the shoulders and nibs of the pen are projected, as hereinafter more particularly described. Fourthly, making the shank or tail of the pen elastic, in which case the pen is held at a given part, or point, or fulcrum, somewhere between the two extreme ends, and farther as regards pen-holders, our said invention consists in the following improvements, (that is to say) :—

First, attaching the pen to a stick by means of an Indian rubber band or Indian rubber bands. Secondly, in making the tube at the end of the stick which holds the pens, of spiral wire, one coil or turn being so closely wound upon the other, as not to allow any action of the pen in a direct line to or from the end of the fingers, or in that direction which has been termed by some longitudinal elasticity, but admitting of every requisite variety of lateral eccentric action. Thirdly, in a flat, arched, or other spring at the end of the stick, having a crimped cup or receptacle for the shank or tail of the pen in which case the shank or tail of the pen must be crimped to fit the holder, which said crimping will be found greatly to steady the pen in the holder. And, lastly, in a screw pin and fulcrum, applicable to our aforesaid elastic tailed pen.

And in fnrther compliance with the said proviso, we, the said Stephen Perry, Edward Massey, and Paul Joseph Gauci, do hereby describe the manner in which our said invention is to be performed by the following statement thereof, reference being had to the drawing annexed, and to the figures and letters marked thereon, (that is to say :)

Description of the Drawing.

Fig. 1, is a pen classed under our first head of improvement, and represents, by the red line, our said additional side cut or slit, which, it will be observed, passed beyond the centre of the back of the pen, and thus destroys the resistance offered at that part by its arched form: this cut may either enter another cut, or an aperture just beyond the centre of the back; and we prefer it to be in the left side; but it may be in the right side, as shown in figure 2.

Fig. 3, is a pen classed under our second head of improvement, and is furnished with one of our said adjustable or sliding springs, which, in this figure, is coloured pink. It will be observed that there is a slit in the spring corresponding with the slit in the pen; and the spring may be slided towards, or from, the point of the nib by applying the nail to the notch or aperture, c, the length of the sliding action is determined by the four shoulders *e, e, e, e,* formed by diminishing the size of the shank at that part, as shown in the profile view at figure 4, the spring just hooks or catches over the edge of this diminished part, as shewn by the underside view shown at figure 5.

Fig. 6, is a pen classed under our third head of improvement; *a,* is a flat underspring, from the upper side of which it will be seen the nibs project.

Fig. 7, is a view of the underside of the pen, shewing that the spring is divided down the middle, and that thus there is an under spring to each side of the pen as at, *a, a,* in this figure.

Fig. 8, is a pen classed under our fourth head of im-

provement, *g*, being a flat elastic back or tail, shewn in plan at fig. 9.

Fig. 10, is another pen of this class, where the flat, elastic band or tail is placed below the nibs and the shoulders of the pen.

Fig. 11, is a plan of the same.

Fig. 12, is another pen of the same class, having a very thin flat elastic tail, *j*.

Fig. 13, is a pen with a crimped shank or tail, to fit a particular kind of holder, which will be hereafter explained.

Fig. 14, is an end view of the crimp.

Fig. 15, is another variety of our flat elastic back, the parts, *i*, *i*, being flat and elastic, though at the extreme end there is a small portion of an arched form to set into the ordinary holder.

Fig. 16, is a side view of fig. 15, and shews the turn over of the central part to form an ink holder, these sorts of turns over of tbe central part of the metal admit of many varieties, another of which is shewn in figs. 17 and 18.

And now, of the penholders,

Fig, 19, is a penholder to which the pen is fastened by means of the Indian rubber band, *m*.

Fig. 20, is another holder of the same class, the pen being fastened to the holder by two bands of India rubber thread at, *n*, and, *o*, this plan is well adapted for the thin flat spring tailed pen, particularly if the wood of the stick be cut away at, *p*, as here shewn.

Fig. 21, is a penholder with the spiral wire tube, herein before mentioned, shewn at, *r*, to give every required kind of lateral elastic action to the pen, without allowing any of what has been termed longitudinal elasticity to it.

Fig. 22, is an end view of the spiral tube, shewing that it is wound flat at one side.

Fig. 23, represents our crimped penholder, with a crimped ended pen in it, the crimped end joins on to the tube which fits on to the stick by being made in one piece with a flat elastic spring, shown at s, which gives all the

effect of our flat under spring pens, with the advantage of the pen being more firmly held in the holder, in consequence of the crimping of both.

Fig. 24, is an end view of the crimped holder.

Fig. 25, is one of our fulcrum penholders, for spring or elastic tailed pens, whether such spring or elasticity is obtained by making the tail of flat elastic metal, or of arched elastic metal or otherwise; at *t*, there is a space cut in the holder, just to let the substance of the pen pass through, at v, is a screw which screws down on the pen, z, being the fulcrum, or point of rest from which both ends play; w, is a guide pin or stud, which passes up through a hole made in the tail of the pen for the purpose; the effect of this arrangement will be, that when the nib of the pen is pressed upon, in the act of writing, the tail will rise in proportion, thus giving a delightful elasticity to the pen.

Fig. 26, is a view of fig. 25, the fulcrum may be obtained equally as well by drawing the pen up a certain point, as by pressing down upon it at a certain point, the former of which plans is shewn in section at fig. 27; x, is a spring; Y, a screw passing through it, and through the holder, which is here shown as a hollow tube, as also through the pen, below which is a nut to prevent its return; the pen here used should be a slit tailed one, such as shewn at fig. 28. By this arrangement the spring, x, will always be drawing up the pen to the holder at that point where the nut is placed; z will thus become a fulcrum for both ends to play from. Now whereas we claim as our invention those improvements in pens comprised under the four heads mentioned in the early part of our specification, and those improvements in pen holders comprised under the other four heads there also mentioned, and such our invention being, to the best of our knowledge and belief, entirely new, and never before used within that part of his said Majesty's United Kingdom of Great Britain and Ireland called England, his said dominion of

Wales, or Town of Berwick-upon-Tweed, we do hereby declare this to be our specification of the same, and that we do verily believe this our said specification doth comply in all respects, fully and without reserve or disguise, with the proviso in the said hereinbefore in part recited letters patent contained. Wherefore, we do hereby claim to maintain exclusive right and privilege to our said invention.—In witness whereof, &c.

Enrolled March 20, 1835.

Specification of the Patent granted to RICHARD BARBER, *of Leicester, Cotton Winder, for an Improvement in Reels for reeling Cotton.*—Sealed October 22, 1835.

WITH AN ENGRAVING.

To all to whom these presents shall come, &c. &c.—*Now know ye*, that in compliance with the said proviso, I, the said Richard Barber, do hereby declare the nature of my invention, and the manner in which the same is to be performed, are fully described and ascertained in and by the following description thereof, reference being had to the drawing hereunto annexed, and to the figures and letters marked thereon, (that is to say) :—

Description of the Drawing.

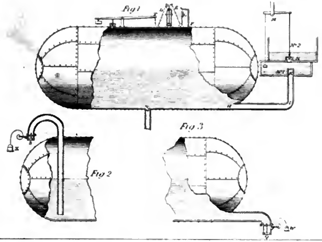
The reels now in use for reeling or having wound upon them sewing cotton, for the purpose of sale, and which constitutes an important manufacture, are most commonly constructed of wood, which is turned or cut down in the middle, to form the barrel on which the sewing cotton is wound, such as is shewn at fig. 1, there being a hole drilled up the centre, which enables the reel to be placed on a spindle during the operation of winding or reeling on of the sewing cotton, and on the upper end it has been common to paste a circular piece of paper with the number or class of sewing cotton which the reel contains, by which a person,

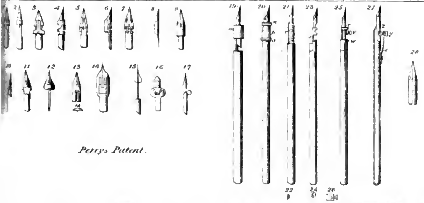
purchasing sewing cotton wound on such reels, may readily make choice of the reels containing the particular number or class of cotton required, all which is well understood; and I have only thus particularly described these reels in order to point out the nature of the reels to which my invention relates, and I would remark, that in place of paper being affixed to the end of such wooden reels, there have, in some instances, been wooden reels made, having a circular piece of thin metal affixed at each end, with the number and class of cotton embossed thereon, both which descriptions of reels, however, are expensive. Now the object of my invention is, to construct the barrel of such descriptions of reels of metal, with ends of metal, or horn, or other material, whereby greater facility of construction will be obtained, and a great variety of ornamented or plain ends may be produced, and when manufactured extensively may be obtained at a very moderate cost.

Fig. 2, represents a reel made according to my improvment; *a*, being the metal barrel or tube on which the cotton is wound or reeled; *b*, is the upper end, and, *c*, the lower end of the reel. One of these ends is shewn separately at fig. 3, consisting of a circular plate of metal; and the metal I most generally employ is brass, which may be lackered, bronze plated, or otherwise, but I do not confine myself to that metal.

Fig. 4, shews the barrel, *a*, separately. In making the ends, *b*, *c*, I make slits or holes, in the centre, as shewn at fig. 3, and then force the opening into a circular form, so that the ends, *b*, *c*, when passed on to the barrel, *a*, and soldered, will be the more strongly secured on that barrel owing to the portions of metal, *d*, *d*, offering considerable extent of surface for the solder to hold by, though other means may be resorted to for that purpose. The soldering I perform by a lamp and blow-pipe, in like manner to that pursued in order to the fixing or soldering of ornamental and other parts of plated goods, which is well understood, or otherwise rivetted or fastened to. I would

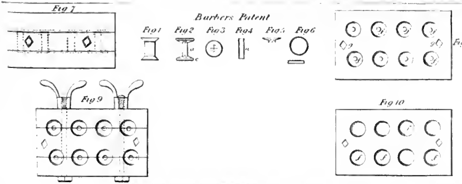
Douglass Patent

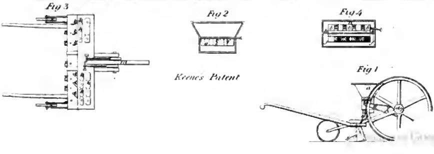




Perrys Patent.

Barbers Patent





Keenes Patent

remark that the ends, *b*, *c*, are turned up all round, as shown by fig. 5, by a fly-press, or at a lathe. The two ends, *b*, and *c*, being fixed on the barrel, *a*, by soldering or otherwise, it will be ready to receive the ornamental or other ends.

Fig. 6, represents a thin plate of metal turned up all round, and capable of being placed on the ends, *b*, *c*, and affixed thereon, in the following manner. Having put the reel, thus far formed, into a suitable chuck of a lathe, and placed, the end, fig. 6, on the reel, the chuck is caused to revolve at the same time the edges of the covering plate are pressed with a burnisher, or such like tool, and thus those edges are turned over the ends, *b*, *c*, and securely affixed thereon, care being observed, however, that one covering plate has a hole perforated in the centre, in order to allow of a spindle passing into the barrel, *a*. When reeling or winding on the cotton, I would remark that such covering plates, fig. 6, may be embossed (by stamping) in various ways; I usually have the king's arms raised thereon, and, in the centre, the number of the cotton which the reel contains, but other devices may be used.

I will now describe the manner of forming the ends of reels with hoof or horn.

Fig. 7, shews a side view of a mould or die with the parts together for forming hoof or horn ends to a series of reels at one time.

Fig. 8, shews the plan of the lower die separately.

Fig. 9, the plan of the middle plate or die, and

Fig. 10, a plan of the underside of the upper plate of the mould or die; *e*, are a series of spindles or pegs affixed in the lower die in the centre of each of the dies or shapes for forming the end of the reel; *f*, shews the series of circular recesses for moulding the hoof or horn; *g*, *g*, are two studs or projecting pins affixed in the lower plate or die, these studs pass through the middle, and into the upper plate, and hold them correctly together. The middle plate or part of the die consists of four parts which, when together, are held by the screw-bolts and

nuts, *h*. The upper die like the under die has a series of recesses, *f*, formed therein for the ends of the reels. The process of preparing and pressing hoof or horn into various articles, such as buttons, knife-handles, &c. being well understood and forming no part of my invention, it will not be necessary to enter into more than a general description, in order to apply that process to the making of the ends to hoof or horn reels constructed according to my improvement. The hoof or horn being boiled, and thus reduced to a soft state, portions thereof are to be formed by cutting to nearly the shape and thickness of the ends of the reels. The pieces which are to form part of the lower ends of the reels are to have holes formed therein, so that they can be forced on the barrels, *a*, on the spindles or pegs, *e*, and into the recesses, *f*, of the lower mould. The middle plate is then to be put on, which can readily be done in consequence of it being in four parts, and the screw-nuts are then screwed up which hold the parts together; pieces of hoof or horn are forced on to the upper ends of the barrels, *a*, but those pieces are not to be perforated, and are to be worked on to the upper end of the barrel by the fingers of the workman, by moving the hoof or horn in different directions, and pressing it at the same time, and when the whole of the barrels in the mould are supplied with hoof or horn, the upper surface of the mould or dies is to be placed thereon and the whole being heated as is well understood to a proper degree, the mould is to be placed under a press and considerable pressure exerted thereon by which means the hoof or horn will be moulded to the figure desired for the ends of the reels, and it will be evident that the surfaces of recesses, *f*, may be engraved to any device which may be desired in order to ornament the ends of the reels. I would remark that the metallic barrels, *a*, when they have hoof or horn ends formed thereon, as above described, may be split down or otherwise in several places for a short distance at each end,

and that portion of the metal being turned or bent outwards will form projections in the midst of the hoof or horn ends which will cause those ends more securely to be held by such barrel.

Having thus described the nature of my invention, and the manner I have pursued to carry the same into effect, I would wish it to be understood that I do not confine myself thereto. But what I claim as my invention is the constructing the description of reels for reeling sewing-cotton, herein explained, with metal barrels as above described.—In witness whereof, &c.

Enrolled April 22, 1836.

Specification of the Patent granted to William Keene, *of Bankside, Southwark, in the County of Surrey, Engineer, for certain Improvements in Machinery or Apparatus for sowing Corn, Grain, and other Seed, and manuring Land.*—Sealed November 2, 1835.

WITH AN ENGRAVING.

To all to whom these presents shall come, &c. &c.,—*Now know ye*, that in compliance with the said proviso, I, the said William Keene, do hereby declare that the nature of the said invention, and the manner in which the same is to be performed, are particularly described and ascertained in and by the following description thereof, reference being had to the drawing hereunto annexed, and to the figures and letters marked thereon (that is to say):—

Description of the Drawing.

In a portion of the upper part of the case, *a*, fig. 1, in the plan, is placed the corn or seed to be sown. In the bottom of this part of the case is a shifting slide, which slide may be drawn out or pushed in by the button, *b*, seen in fig. 2. In the length of this slide are transverse slides, which may be opened and shut at plea-

sure, to let out or retain the corn in the superior part of the case. On the transverse slides being opened the grain falls into cavities made on the circumference of a cylinder, *c*, represented by the dotted circle in fig. 1, and is seen in front view in fig. 2, and which cylinder, together with the grooved or canulated cylinder, *g*, *g*, fig. 4, for delivering the manure, are made to revolve by either a ring eccentric, or a crank, or any other means producing a rotatory motion, and which motion is in the plan communicated or produced by the shaft, *d* 2, fig. 1. At the openings made by the transverse slides to permit the grain to fall into the cavities of the cylinders there are springs, which at the same time that they prevent more grain entering than will fill the cavities, yield or uplift to any stone, pebble, or extraneous hard substance which may get into the cavities with the grain, and permits it to pass, closing down again immediately afterwards in virtue of its elasticity, and thus maintains regularity in the qnantity of seed carried off by the cylinder in its rotation. The cavities in the cylinder are in series of circles around its circumference, and these circles of cavities are in series of various sizes appropriate to the grain to be sown, and the grain falling from the cylinder into hollow socks, shewn at, *s*, fig. 1, is shewn in furrows at such distances as may be regulated at pleasure by suppressing the communication of the seed-box, with the socks, or taking out one or more of the said socks. Manure in powder is placed in the portion of the case, *f*, the case itself being divided into two compartments, one for the seed to be sown, the other for the manure. The division is shewn by the line of partition, *h*, *h*.

The grain and manure are guided into the socks by tubes fixed in opposition to the circles of the cylinders destined to give out the grain and manure. These tubes are seen at, *t*, *t*, figs. 1 and 3.

The sowing and manuring are effected by the machine being drawn or driven by man, or animal power. The

sock cuts or opens the furrows to be sown, and the seed and manure carried into the sock by the cylinders, fall down the hollow of the sock into the furrows, and attached to the hind part of the sock is a rake, *r*, figs. 1 and 3, joined by a loose hinge to the sock, and which rake covers the seed which has been sown with the earth thrown up by the sock in the opening of the furrow.

The depth at which the grain may be sown is regulated by lowering or raising the socks, thus opening furrows of more or less depth.

Having thus described the nature of the invention, I would have it understood that I do not claim any of the parts separately, of which the same is composed, but that I confine my claim of invention to the combining of the various parts as above described, whereby the corn or grain and manure together, or either separately, are regularly delivered and sown in the furrows made by the machine, and the seed covered with earth by the rake attached to the socks after being sown.—In witness whereof, &c.

Enrolled May 2, 1836.

Specification of the Patent granted to Robert William Sievier, *of Southampton Row, in the Parish of St. George, Bloomsbury, in the County of Middlesex, Gentleman, for an Improvement or Improvements in the making or manufacturing of elastic Goods or Fabrics applicable to various useful Purposes.*—Sealed January 17, 1833.

To all to whom these presents shall come, &c. &c.—*Now know ye,* that in compliance with the said proviso, I, the said Robert William Sievier, do hereby declare that the nature of the said invention, and the manner in which the same is to be performed, are particularly described and

ascertained in and by the following description thereof, (that is to say):—

The first object which I propose, is to manufacture an article by the ordinary knitting frame or similar kind of machinery, in which cords or strands of Indian-rubber shall be introduced between the loop of stitches of the fabric, for the purpose of forming elastic cords or bands round the margins or other parts of stockings, socks, gloves, nightcaps, drawers, and various other articles of clothing. The second object is to manufacture in the ordinary loom, an elastic woollen cloth, by the introduction of cords or strands of Indian-rubber among the longitudinal threads or yarns which constitute the chain or warp, and also among the transverse threads or yarns which constitute the weft or shoot, and which cloth shall be capable of being afterwards felted and dressed with a nap. The third object is to produce a cloth from cotton, flax, or other suitable material not capable of felting, in which shall be interwoven elastic cords or strands of Indian-rubber, coated or wound round with a filamentous material. The first of these improvements I effect by preparing knitting frames, or other similar machines in the usual way for the production of the knitted materials, called stocking fabric, and when the same are set to work, and the fabric has been manufactured by the ordinary knitting process up to the part at which I desire to introduce the elastic cord or strand, I then, by the adjusting screws of the machine, provide for the elongation or contraction of the lengths of the loops or stitches of the row next to be produced across the machine, in order to form a channel to receive the said elastics cord or strand. And having prepared fine stripes of Indian-rubber, which may, if desired, be coated or covered with a filamentous material, as described in the specification of my patent dated the first day of December 1831, and enrolled in the office of the Rolls Chapel of the High Court of Chancery in June 1832, I conduct such thread, cord, strand, or

strip of Indian-rubber by means of a long needle, hook, pincers, or other suitable apparatus, answering the purpose of a shuttle, across the machine between the row of stitches or loops which were last made, and those which are then about to be formed, and having drawn the said Indian-rubber, thread, cord, or strand, strait and smooth, I complete the last mentioned row of loops or stitches, by the ordinary movements of the machine, which incloses the Indian-rubber thread, cord, or strand, and keeps it securely in its place, interwoven with the threads of the fabric. A second thread of Indian-rubber is, in the like manner, introduced between the next or other subsequent row of stitches, and is, in the same way, confined; and any further number of these threads, cords, or strands may, by the same means, be inserted and interwoven into the fabric at such parts as may be required for the purpose of producing (when the selvages are connected or whipped together) elastic bandages, garters, or bracings around the stocking, sock, glove, night-cap, or other article of wearing apparel.

In effecting the second improvement, the production of an elastic woollen cloth, I introduced into the loom among the longitudinal or warp threads, or yarns of the intended fabric, longitudinal threads, cords, or strands of Indian-rubber, or I constitute the warp entirely of such strands, either covered with a filamentous material or not, as before described and through or between the threads, cords, or strands of warp, I pass the transverse weft or shoot threads or yarns in the ordinary way of weaving, for the purpose of effecting that intervention, which produces the cloth, these transverse or weft threads being composed in part of the Indian-rubber strands, or of the ordinary threads or yarns of the fabric, according as I may wish to produce a cloth, which shall be elastic lengthwise only, or in both directions.

If the elastic cloth so produced should be intended for outward garments, with a nap upon its surface, I should employ, in connection with the Indian-rubber strands,

yarns spun from short wool, which, after having been woven, I should finish as the woollen cloths are usually finished; that is, felt the wool in the fulling stock, raise the pile by gig machinery, or by hand-cards or teazels, and afterwards, shear the nap down to a fine smooth surface.

In manufacturing an elastic cloth from cotton, flax, or other material, which is not intended to be milled or fulled, I introduce into the fabric, threads or strands of Indian-rubber, which have been previously covered by winding filaments tightly round them, through the agency of an ordinary covering-machine or otherwise, these strands of Indian-rubber being applied as warp or weft, or as both, according to the direction of the elasticity required. By thus combining the strands of Indian-rubber with yarns of cotton, flax, or other non-elastic material, I am enabled to produce a cloth which shall afford any required degree of elastic pressure, according to the proportions of the elastic and non-elastic material.

It remains only to add, that the strands of Indian-rubber are, in the first instance, stretched to their utmost tension, and rendered non-elastic, as described in my former patent, and being in that state introduced in the fabric, they acquire their elasticity by the application of heat after the fabric is made.

Lastly, as my invention consists solely in the employment of strands of Indian rubber, in connection with yarns, in the way described for manufacturing elastic goods or fabrics, I have not deemed it necessary to describe any particular kind of machinery for carrying the same into effect, as such machinery is well known, and forms no part of my invention.—In witness whereof, &c.

Enrolled July 17, 1833.

Specification of the Patent granted to FREDERICK CHAPLIN, *of Bishop Storford, in the County of Herts, Tanner, for an Improvement in Tanning Hides and Skins of certain Descriptions.*—Sealed February 18, 1836.

To all to whom these presents shall come, &c. &c.,—*Now know ye* that, in compliance with the said proviso, I, the said Frederick Chaplin, do hereby declare the nature of my said invention, and the manner in which the same is to performed, are fully described and ascertained in and by the following statement thereof (that is to say) :—

According to the ordinary process now in general use for tanning the hides and skins of bulls, oxen, cows, buffaloes, horses, what are called East India kips, and market calf skins, to which my invention is confined, the hides having been first deprived of the hair, and otherwise prepared, as is well understood, are submitted to a process of continued steeping in tanning liquor in pits till the operation of tanning is complete; but such process is exceedingly tedious, taking many months to complete the same. There have, however, been many attempts made to facilitate the process of tanning those description of hides and skins by affixing them in rings or frames, and thereby forming a sort of bag, into which tanning liquor was filled, and by means of pipes or pumps considerable artificial or hydrostatic pressure was induced on the confined fluid to cause it to pass or percolate through the hides or skins, such operation being performed with a view to arrest the tanning matter of the liquor, and to cause it to penetrate and be received more quickly by the pores, and hence intending materially to shorten the process of tanning such description of hides and skins as aforesaid. There has also been means proposed for suspending a number of such hides and skins in a closed chamber, or vessel filled with tanning liquor, and by means of pneumatic or hydraulic pressure, to cause such

hides more quickly to take up the tanning matter; and another method proposed to facilitate and quicken the process of tanning hides and skins consists of filling tanning liquor into two hides or skins, which had been previously served into a sort of bag, and placing such bag in a rack, cage, or frame, constructed of bars of wood, to prevent the bag being distended, and submitting such bag so contained in an open rack or cage to a heated atmosphere, in order to evaporate the water of the tanning liquor as it passes through the pores of the hides or skins, with a view to cause the tanning matter contained in the tanning liquor to be deposited in or retained by the pores of the hides and skins so operated on; to all which processes there are objections, both as to expense of apparatus, and otherwise; and a method of tanning sheep, and such thin and small skins, has been in some instances resorted to, whereby one or more skins having been sewed up into a sort of bag, and filled or partly filled with tanning liquor, the same has been permitted to penetrate through such small and thin skins till they have become sufficiently tanned. Now the object of my invention is to apply a similar principle to that last mentioned, with certain modifications and means to the tanning of bull, ox, cow, buffalo, horse, East India kips, and market calf hides and skins, whereby the same may be tanned in a period varying from forty-eight hours to ten days, depending on the quality of the hides or skins, and without the aid of additional artificial hydrostatic or pneumatic pressure, and without the aid of any open wood framing, or cage or artificial heat, as has been spoken of above.

Having thus generally pointed out the nature of my improvements in tanning certain descriptions of hides or skins, I will proceed to explain the process pursued by me in order to perform the same.

Description of the Process.

After the hides or skins have been deprived of the hair,

and otherwise prepared for tanning in the usual way, according to the kind of leather to be made, each hide or skin is to be made into a bag, by carefully sewing the edges together with small but strong packthread, leaving only one aperture at which liquor may be introduced, or more skins than one may be similarly formed into a bag. They are then to be washed, by dipping once or twice in a weak ooze or tanning liquor, to free them from any dirty matter which may adhere to the surface, and immediately afterwards filled with strong tanning liquor, one man holding up with both hands the end or part of the hide or skin left unsewn, as above stated, while another man pours in the liquor by means of a common jet, the hide or skin lying in the alley or path between the vats of an ordinary tan yard, or on a board or boards placed over a vat or vats, or on the ground adjoining the vats, or in any other convenient floor or place, so that liquor may readily be obtained to fill the hides or skins, and the liquor which drains therefrom may run into some vat or vats, and so that the hides or skins may be kept clean. When a hide or skin is full of liquor, the opening through which the liquor has been introduced is to be closed by tying the sides of the orifice together with a piece of string, so that the bag thus formed and full of liquor or ooze may be turned in all directions, which is important to the good and equal tanning of the hides and skins, and which I am enabled to do with great facility, by dispensing with the frames or apparatus heretofore used, and which have been before mentioned. The liquor will very soon be seen to have penetrated the hides or skins in almost every part, and will drain from them in considerable quantities. In addition to this some liquor will probably escape through the aperture in the seams, particularly when it has been only recently filled. The liquor thus escaping may be suffered to remain in the vats into which it runs with other liquor, and to be afterwards made into fresh ooze, as hereinafter described, or otherwise; and it should be replaced in

the hide or skin by frequently untying the mouth of the orifice and introducing fresh liquor, so as to keep the hide or skin as nearly as possible always full of liquor, carefully tying up the opening after each filling, in order that that part, as well as all other parts, may occasionally be turned downwards. After lying for two or three hours in the position in which it was left, after being first filled, the hide or skin should be turned over, so that the part before lying downwards may be brought upwards; and the oftener it is turned over or moved, in order to vary the position of the bag, the better, and more equally it will be tanned. This process is to be continued a longer or shorter time, according to the strength of the liquor used, and the thickness of the hide or skin, which will quickly be judged by a workman accustomed to tanning. By the aid of the liquor made, as hereinafter described, and which I prefer to use, the thickest hide may be perfectly tanned in seven or eight days, and a market calf skin or horse hide in forty-eight hours. Supposing them to be filled with fresh liquor, and tanned over four or five times during the day, and remain without any attention during the night, either the flesh or grain side may be outwards, but I prefer the flesh to be outwards. Some advantage will be obtained by raising to the height of twelve or eighteen inches that end of the boards or other flooring on which the heads of the hides or skins are laid, so that the tail ends may be the lowest, as this will cause the liquor to act more continuously and strongly on that part which is the thickest and most difficult to tan. It will also facilitate the separation of the liquor which flows from the hides or skins from that with which they are to be replenished.

In the process of tanning here described I use liquor made from the terra japonicâ, or catechu, but I do not confine myself thereto. Such liquor or ooze may be prepared in the following manner:—put about three hundred weight of the terra japonicâ into an empty vat (suitable

for twenty-five to thirty hides), and pour about one hundred gallons of boiling water upon it, let it stand about half an hour without moving, then stir and plunge it up thoroughly, so as to bruise the squares that may remain undissolved, as much as possible; then add enough common tanning ooze (the strength of it is not material), to fill three-fourths of the vat, plunge this up well and use it immediately. This is the method to be adopted in making an ooze with the terra japonicâ for the first time in a yard in which that article has not before been in use. To renew an old ooze it is only necessary to remove the liquor from the vat, leaving whatever sediment may remain at the bottom, and adding to this about one basket, or one and a half hundred weight of the terra japonicâ, then pouring about sixty gallons, or one hundred gallons, if there is a great quantity of sediment remaining, and plunging it up after standing a short time, as mentioned above; then bring back the same liquor which was taken out. In this manner every ooze may easily be renewed as often as may be required. There should always be a considerable quantity of thick matter or sediment in every vat, and this should be well stirred or plunged up whenever liquor is taken to fill the hides or skins, so that some of the thick matter may go into them along with the liquor, not only because it keeps up the strength of the liquor, but also by filling up the interstices of the seams it prevents them from leaking so much as they otherwise would. If there are any large holes in the hides or skins, they should be sewed up. Small holes may easily be stopped by wooden pegs or plugs thrust into the holes at the time of filling. When the tanning is completed, the seams are to be ripped open with a knife; and if the appearance of the sewing is objected to, it may be removed by cutting off a very narrow strip all round the edges of the hides or skins, after washing them, so as to free them from the thick matter adhering to them. If they are intended for sole leather, throw them into a common

bark ooze for an hour, and hang them up to dry. If they are for dressing leather, let half a hundred weight of sumach be steeped for half an hour in fifty gallons of boiling water, and then added, both sumach and water, to a common bark ooze, sufficient to cover twenty-five heavy hides, or a proportionate number of skins. Let the hides or skins remain in this ooze for forty-eight hours, and be frequently handled, then hang them up to dry. In either case a very small quantity of cod oil should be rubbed over both sides of them as soon as they have ceased to drip, and the drying may then be managed in the usual way, according to the kind of leather intended to be made.

If the matter or appearance called bloom be wished, it may be obtained by means of oozes made from bark or valonia, and applied in the usual way after the tanning, as above described, has been completed.

Having thus described the nature of my invention, and the manner of carrying the same into effect, I do declare my improvements to consist, first, in tanning the hides or skins of bulls, oxen, cows, buffaloes, horses, East India kips, and market calf-skins, by simply sewing them into bags, and filling such bags with the tanning liquor, and permitting it to gradually percolate through, and frequently replenishing them with fresh liquor. And by frequently moving or turning over of such bags on suitable surfaces for admitting of the liquor to run into a vat or receptacle again, to be used when such process is conducted without the aid of additional artificial, or hydrostatic, or pneumatic pressure, and without the aid of any wooden cage, or frame, or artificial heat, which have heretofore been considered necessary when endeavouring to tan the hides or skins of bulls, oxen, cows, buffaloes, horses, East India kips, and market calf-skins, by a quicker process than that of steeping in pits, as is the general means now in use. Secondly, I claim the application of an ooze or tanning liquor obtained from terra japonicâ, when em-

ployed with the particular process of tanning above described as applied to the certain descriptions of hides and skins herein mentioned, though I do not claim the tanning of such hides or skins generally by that liquor or ooze, the same having been before used when tanning such descriptions of hides and skins in pits.—In witness whereof, &c.

Enrolled June 20, 1836.

ALTERATIONS AND DISCLAIMERS IN SPECIFICATIONS.

In the matter of a patent granted to STEPHEN PERRY, *of Wilmington Street, Wilmington Square, Gentleman;* EDWARD MASSEY, Senior, *of King Street, Clerkenwell, Watchmaker; and* PAUL JOSEPH GAUCI, *of North Crescent, Bedford Square, Artist, all in the County of Middlesex, for their Invention of "Certain Improvements in Pens and Pen-Holders," bearing date at Westminster the* 20*th day of September,* 1834.

Disclaimer and memorandum of alteration entered, pursuant to an Act passed in the 5 & 6 years of His present most gracious Majesty's reign, entitled "An Act to amend the Laws touching Letters Patent for Inventions," with the Clerk of the Patents for England, by James Perry and John Heys, both of Red Lion Square, in the county of Middlesex, Metal Pen Manufacturers and Co-partners, they having obtained the said Letters Patent by virtue of three several indentures of assignment; one of such indentures bearing date the 19th day of May, 1835, and made between the said Stephen Perry, of the one part, and the said James Perry and John Heys, of the other part; another of such indentures bearing date the 19th day of Februay, 1836, and made between the said Edward Massey, of the one part, and the said James Perry and John Heys, of the

other part; and the third of such indentures bearing date the 19th day of May, 1835, and made between the said Paul Joseph Gauci, of the one part, and the said James Perry and John Heys, of the other part.

We, the said James Perry and John Heys, do hereby declare, that since we have become assignees of the said patent we have been advised, that it is doubtful whether so much of the improvements in pens forming the invention for which the aforesaid letters patent were granted, as relates to the spring sliding on the back of the pen, and as is hereinafter set forth, is a new invention: for this reason we, the said James Perry and John Heys, in that part of the specification which states generally in what the said invention consists, do hereby disclaim the following words; that is to say, "Secondly, in an adjustable or sliding spring acting downwards, but not laterally upon the nibs, and increasing or diminishing the resistance and consequent hardness of the pen, according as the said spring is advanced towards, or caused to recede from, the point of the pen." And further on in the said specification, where fig. 3 is described, we hereby further disclaim the following words, figures, and letters; that is to say, "Fig. 3, is a pen classed under our second head of improvement, and is furnished with one of our said adjustable or sliding springs, which, in this figure, is coloured pink. It will be observed that there is a slit in the spring corresponding with the slit in the pen, and the spring may be slided towards or from the point of the nib by applying the nail to the notch or aperture c; the length of the sliding action is determined by the four shoulders, *e*, *e*, *e*, *e*, formed by diminishing the size of the shank at that part, as shown in the profile view at fig. 4; the spring just hooks or catches over the edge of this diminished part, as "shown by the underside view shown at fig. 5." And further on in the claiming clause, at the conclusion of the said specification, it is necessary to make the same consistent with the foregoing part of the said specification,

for which reason we hereby make the following alteration in the said claiming clause; that is to say, instead of the words, "those improvements in pens comprised under the four heads," we hereby substitute the words, "those improvements in pens comprised under the first, third, and fourth heads."—In witness whereof we, the said James Perry and John Heys, have hereunto set our hands and seals this 26th day of April, 1836.

James Perry (L. S.)
John Heys (L. S.)

To the Clerk of the Patents of England.

This is to certify that James Perry and John Heys, both of Red Lion Square, in the county of Middlesex, metal pen manufacturers and co-partners, assignees of the above named Stephen Perry, Edward Massey, and Paul Joseph Gauci, have applied to me for leave to enter with you the above written disclaimer and memorandums of alteration of part of the title, and of the specification of a certain invention, for which letters patent were duly granted to the said Stephen Perry, Edward Massey, and Paul Joseph Gauci under the great seal, bearing date at Westminster the 20th day of September, 1834, and the specification of which was enrolled on the 20th day of March, 1835: and on considering of the same application, and the same having been advertised in the London Gazette on the 19th day of April, the Times and Morning Chronicle, on the 18th day of April, 1836, and no objection having been made to the said application, I have accordingly granted leave to the said James Perry and John Heys to file their said disclaimer and memorandum of alterations of part of the title and of the specification of the said invention, pursuant to the statute passed in the 6th year of the reign of His present Majesty, entitled "An Act to amend the Law touching Letters Patent for Inventions." R. M. Rolfe.

Enrolled April 30, 1836.

LAW REPORTS OF PATENT CASES.

In the Court of Common Pleas, before the Lord Chief Justice Tindal, and a special Jury.

CORNISH and another *v.* KEENE and another.

Mr. Hindmarsh opened the pleadings.

Mr. Serjt. Wild.—May it please your lordship, and gentlemen of the jury, I regret the absence of my learned friend, the attorney-general, by which the important duty of opening this case falls to me. You have learned, from the opening of the pleadings, that the cause involves the question of the validity of a patent in the name of Mr. Sievier, who has assigned a moiety to Mr. Cornish. The defendants deny that they have infringed the patent. They say that Mr. Sievier was not the true inventor; and lastly, they say that, which if true, we should not have been here to day; namely, that it is no improvement—because it is not in matters where the invention is of no use and no improvement—that it often happens persons are much disposed to copy. Persons seldom contend for that which is of no value; it may therefore be fairly inferred (whether the plaintiff is the inventor or not) that the subject-matter in dispute is of some value. I will, as shortly as I can, state to you, what was the course of manufacture in the article before the present patent was taken. Originally when first India-rubber was used in this country, the mode was to introduce the warp or longitudinal thread in the fabric, to be woven of India-rubber (caoutchouc) drawn out into long strands. It is a peculiarity belonging to this article that though very elastic, if drawn out to its extreme length, and kept in that state of tension for a certain time, it loses its elasticity. Those strands were kept stretched to their full length till that effect was produced, then it was introduced into the warp and the woof-weft or transverse thread was introduced

across those longitudinal threads of India-rubber. After the article was woven it was necessary to restore the elasticity, which had been lost through the circumstances I have mentioned. The passing of a hot iron over the surface has the effect of restoring the elasticity to the India-rubber (by which name I will call the article, as being most familiar), and then I believe that the elasticity exists to the extent of giving a contracting power of one-fifth of the whole length. In the article I have mentioned you will observe the India-rubber was in no way covered, except so far as the transverse threads of cotton or linen made it so. They in truth scarcely formed a part of the fabric; and if any of them broke, the effect you may readily suppose was very much to destroy the usefulness and power of the fabric. Afterwards, before the India-rnbber strand was introduced into the warp, it was what was called braided; that is to say, it was covered round in two opposite directions with a fine filament of some thread or other, and the India-rubber strand being then wound round or braided (an operation very familiar to persons engaged in the trade), but that was not found to answer; the braiding partly remedied some of the defects but not entirely, that plan was discontinued, and then another was adopted, which caused the articles I now hold to be made, and that mode was this :—the longitudinal strands of India-rubber were placed in the loom, but then above and below them were placed strands of cotton or other threads, so that the fabric when made consisted of three distinct layers (if I may so say) of threads, the top and bottom of cotton or other material of that description, the layer in the middle of India-rubber. That produced a thick and heavy article; and besides that, the India-rubber was counteracted by the surface above and below; and though the India-rubber regained part of its elasticity by the application of a hot iron, its power was restrained by the materials with which it was connected; the elasticity was therefore partial. Thus the

articles were so heavy and so little elastic as to be found very little suited for surgical purposes. Mr. Sievier, the patentee, in this state of things, addressed his attention to the subject, and the article which he has produced is the one I now hold, and the superiority consists in several particulars. The India-rubber exercises the power of its elasticity to the full extent which it possesses. The India-rubber controls the degree of expansion and contraction of which the article will admit. In the next place it is extremely light: it is porous; and besides that, from the material which is used, it can be manufactured at a considerably less cost than the old article; and I am satisfied you will find, in the course of the evidence, that no sooner had Mr. Sievier introduced his invention into the market than it excluded all the old articles. Now, gentlemen, having stated to you the properties of the articles made under the patent, I will just describe how those properties are produced. In the old manufacture the entire of the layers or plane was of strands of India-rubber close together. Mr. Sievier introduced the India-rubber only at intervals, there are therefore strands of India-rubber, with intervals filled up with threads of cotton or other material. These India-rubber strands being placed in the loom in their state of greatest extension, when they cease to exercise their contractile power the strands of cotton or thread are also placed in the warp, not merely in the woof, but introduced into the same plane, so that the entire surface consists first of several strands of cotton or thread, then strands of India-rubber, and so on to the width of the intended fabric, when that is made, a hot iron is applied to restore its elasticity, the effect of which is, that the intervening space being so light and so thin, the India-rubber is the commanding ingredient. It is that which gives the degree of expansion or contraction; and when the India-rubber contracts and draws the other ingredients along with it, it presents the puckered appearance which you here observe. Now

I am satisfied, if the instructions with which my friends and myself are furnished are correct, that there will be no pretence or colour for the introduction of any article whatever in which the India-rubber is introduced at intervals in the same plane or surface with the other material forming the substance of the web. I have explained to you the different articles which appear to have been constructed before this patent. We shall show the introduction of this to the trade, and you will find the immediate effect of the introduction of this article. It will be proved to you by medical gentlemen who have used it, that the effect was beyond any thing before known, and will show, to the extent of their knowledge, that it was entirely novel, and that it was a most decided improvement, by which the sufferings of mankind are allayed. I understand that it is intended, on the part of the defence, to attempt to show that somebody or other has talked about or affected to make some such article. We are perfectly prepared to meet and repel such evidence. There is one objection on the record, which is this, that the specification does not correctly describe the article. Gentlemen, Mr. Sievier in his specification describes this as applicable to three different objects. First, to the introduction of this article or fabric into another fabric, where that other fabric is required only to be partially elastic, such as draws or gloves. The second object is to introduce this article into cloth. The third object is the article I have described to you for bandages, braces, and things of that sort. Those are the three things described in the specification. Gentlemen, the best proof whether this is described, or not, in the specification, will be that we shall call persons before you, who, without any other aid than the specification, have manufactured the article, and, of course, the question is not whether any person wholly unacquainted with weaving, or the trade to which this belongs, should understand it, but whether a person of a reasonable competent knowledge of the subject

does understand it, because if a patent depended on all the world understanding it, perhaps there would be no patent good at all, therefore we are to suppose a person to bring a general knowledge of the subject: in other words, you are asked, is it a fair and reasonable statement which a person of ordinary capacity and knowledge would be able to carry into effect, I believe no doubt will remain on that, I will not therefore take up more of your time but proceed to call witnesses.

The patent was put in, and also an official copy of the specifications, which were read.

John Rogers sworn. Examined by *Mr. Serjeant Stephens.*—I am a wholesale brace manufacturer, have been so for some time, from its first introduction into this country which was about 1829. In addition to braces, surgical bandages are made of the web, and garters and things of that description. I am acquainted with the article made under Sievier's patent, the article, No. 3, is according to the patent; there are various specimens of the article, No. 3, they are all according to the patent. I have bought articles of that description from several; I never purchased any such before January, 1833. I have purchased them largely since from the plaintiffs, Cornish and Sievier, from the date of the patent to this time. I am acquainted with the specimens, No. 1 and No. 2; never knew the articles, No. 3, before the patent, those before made differed materially from the patent articles. In No. 3, the warp is composed of India-rubber threads covered or braided, and cotton yarns or cords which form part of the same warp, the yarn is between each strand of India-rubber instead of being above or below. No 3, has advantages which Nos. 1 and 2 have not, it is more elastic for surgical bandages, it is lighter and is much cooler and cheaper. This is owing to there being a less number of India-rubber strands; the weft is of cotton yarn. I have bought more extensively of the patent article than the old one. I have purchased these articles from the

defendants since the patent. The kind of article most in use before the patent was like Nos. 1 and 2, but the articles, No. 3, are now most required.

By the *Lord Chief Justice.*—Then No. 2 is not a patent article.

Witness.—No; nor is No. 1.

Sir F. Pollock.—Your Lordship will have more of that by and by.

Examination of the witness continued by *Mr. Serjeant Stephens.*—I have never bought No. 3, or anything like it before the patent. The article, No. 4, is as nearly as it can be made like the plaintiffs'. I purchased the article, No. 4, in the latter part of 1834. I bought it of Messrs. Keen and Co., the defendants. I should have known if such articles had been in the market before; I think I should have known if it had ever before been produced. I am acquainted with the manufacturers, there are not more than seven or eight, and of them only three or four manufacture extensively.

Cross-examined by *Sir Frederick Pollock.*—I have been in trade twelve or fourteen years. First heard of these articles three or four years ago; we had brace-web from Paris previously to that, I never saw them so far back as 1820. The turning India-rubber to account in this way, by a strip of it being covered over with a fabric of cotton was known as far back as 1829, though not made in England, and used for braces and various articles.

The Lord Chief Justice.—That is, the art of twisting the fabric of cotton round a filament of India-rubber was known.

Witness.—Yes; it was in use for braces and belts, I did not know it for any thing else.

By *Sir F. Pollock.*—In No. 2, the filaments or threads of India-rubber do not touch each other, and is obliged to be a much thicker article to do so. There is much difficulty in weaving it; particular kinds of machinery are necessary. The looms have to be fitted up in a different

way to what other looms are. The old looms will do with some additions; there must be bobbins made to carry the India-rubber threads. The principle of construction of No. 4 is the same as No. 3, and the principle is, the India rubber threads have a cord or thread run between them, alternately, or every other two, or every other thread as you want the elasticity of the web, which is different to laying them above and below. India-rubber and cotton had been mixed before. The principle of the plaintiffs' patent was the placing the threads alternately, and the web being more elastic.

Sir F. Pollock.—Don't confound the effect with the principle.

The Lord Chief Justice.—In effect it is the same question, what is the difference between this and former discoveries.

The Witness.—The only novelty I can see is that the threads are laid alternately, the web is much more elastic.

Several specimens of web were handed to the witnesses, marked A, K, W, and W A, which he stated were made on the same principle as that marked, No. 3, but not so well made.

Re-exemined by *Mr. Serjeant Stephens.*—The brading of India-rubber was know before the patent; No. 1, is so done; and uncovered threads of India-rubber with cotton were known before the patent; No. 2 is so made. I never knew India-rubber, covered or uncovered, combined with cotton, as it is in No. 3, before the patent. In No. 2, there is no yarn placed in the same plane with the India-rubber. I never saw the specimens, nor similar ones, A, W, K, in the market before the patent.

Benjamin W. Hickling sworn. Examined by *Mr. Hindmarsh.*—I am a wholesale brace-maker, and have been in that business four or five years. I am in extensive business, I remember the first introduction of elastic webs. The specimen No. 1, has every strand composed

of India-rubber. I remember Sievier's patent being taken out. I bought a quantity of No. 3, in August 1834, but had seen it before that time; never saw specimens of that kind before 1833. I purchased similar articles in October, 1834, from the defendants, Keene and Co. I am well acquainted with the article, No. 3; it is cheaper, but I do not think it so good for braces as No. 1. I now sell most of No. 3.

Dr. Andrew Ure sworn. Examined by *Mr. Attorney-General.*—I have attended to the fabrics made of India-rubber before 1835. I have seen the specification of Sievier's patent, and the web made according to the patent, and the articles, No. 3, of elastic and non-elastic threads. I have seen the article No. 1, frequently. The peculiarity of No. 3, is, that it consists of filaments or strands of India-rubber, interstratified with threads of cotton or other textile matter in the same plane; and those strands of India-rubber may be placed at any distance asunder, and the intervals in the same plane filled up with common thread. I consider No. 3 a great improvement over No. 1. It may be made of any degree of elasticity—and cheaper. No. 3 is lighter and better adapted to various purposes, and particularly adapted to medical purposes, and is a very important improvement for that purpose. I have read the specification, and do not see the least obscurity in it. No. 4 is on the same principle of structure as No. 3; the parallel strands constitute the warp, partly elastic, and partly inelastic. I consider No. 4 the same in principle as No. 3.

Cross examined by *Sir F. Pollock,*—No. 4 is certainly the same as No. 3. No. 1 is made by every cord being an Indian-rubber cord, covered with cotton. No. 4 differs from No. 1. So far as No. 4 is concerned, it is but mixing together two things, each of which have been used before for the same purpose; but it is a new combination. No. 3 might have been known before, but my attention was first called to it about four months ago.

Re-examined by *Mr. Attorney-General.*—Nos. 3 and 4 are of the same structure. No. 4 consists of braided strands of India-rubber, alternately interstratified with threads of common fibrous matter; and such is the case of No. 3; and Nos. 3 and 4 are essentially different from Nos. 1 and 2.

George Lindsey sworn. Examined by *Mr. Serjeant Wilde.*—I am a weaver, and in the employment of the plaintiffs, and have been ever since 1833. The articles No. 3, are manufactured by my employers; never saw such articles manufactured before I went to plaintiffs' employ. The principle of the manufacture is an elastic one, modified by combined threads. I have been in the defendants' service six months previous to entering that of the plaintiffs'. I left the defendants' service in consequence of their saying they were being beaten fairly out of the market by those who entered it long after them, and that they were under the necessity of lowering their weavers' wages. The article they were manufacturing as to which they were being beaten out of the market was elastic webbing. I never saw web with elastic and nonelastic strands before 1833. I have read Mr. Sievier's specification. I have made the second article in the patent, which is a woollen manufacture, and also the article No. 3. I am quite certain any weaver understanding his business would be able to make the invention from the specification.

Cross-examined by *Sir F. Pollock.*—I should suppose that a web of all elastic had been known before. No. 3 is of two sorts, elastic and nonelastic. Messrs. Keene and Co. had, when I was in their service, several looms, by which they made such articles. I do not remember any alterations in such looms when I was there. There were intermediate materials made by me for the defendants. I used two shuttles, one with elastic, the other with nonelastic materials: it is done for tying the India-rubber in —it cannot be done without. This piece resembles what

I made for defendants; but there is a greater quantity of nonelastic material in it, but it is of the same principle; that is, the intermediate material latitudinally.

Sir F. Pollock.—Your lordship will find in the patent there is nothing about longitudinally or latitudinally.

The Chief Justice.—As far as the case has gone, it is longitudinally.

Mr. Creswell.—He says at the defendants he only wove latitudinally, therefore it resembles that which he wove at the defendants'.

Cross-examination continued.—That which I wove at the defendants' would be elastic latitudinally instead of longitudinally; its elasticity would be on the same principle as No. 3. When in the service of the defendants I never saw a piece resembling that marked K. I never was asked by Mr. Benjamin Nicholls to make such as is marked K.

Re-examined by *Mr. Attorney-General.*—I never saw any of the article, No. 3, made at defendants'.

William Morton sworn. Examined by *Mr. Serjeant Stephens.*—I am a frame-work knitter. I have seen the specification of plaintiff's patent. I have worked, according to the description of the invention, to produce the first object of the invention, and succeeded in producing it. It was from the specification I made it.

John Pointer sworn. Examined by *Mr. Hindmarsh.*—I am a silk-weaver; have been so for forty-four years; I have read the specification of the plaintiff's patent; I made the two pieces of No. 3 from the description. The question was asked me, whether I understood the phraseology of the specification; I said I believed I did; I tried to make it according to the description, and perfectly succeeded.

Cross-examined by *Mr. Creswell.*—You may call me a stupid workman, but, at all events, I always gave satisfaction to my employer. The raw material was brought to me

by Mr. Sievier. I consider that as the cotton is not elastic, the closer the union between the two articles the less elastic. I therefore made the first with one-third elastic, and the other two-thirds nonelastic.

Re-examined by *Mr. Attorney-General.*—I made the pieces exclusively from reading the specification.

Frederick Skey sworn. Examined by *Mr. Attorney-General.*—I am assistant surgeon at St. Bartholomew's Hospital, and lecturer on anatomy. At the request of Mr. Sievier, I, four or five years ago, made an experiment with elastic webbing, but at that time advised Mr. Sievier that I thought it would not answer for surgical purposes. The description of webbing then tried was like No. 1.; it was too dense, and required too much force to extend it. Several months after Mr. Sievier brought another specimen, which answered admirably for many surgical purposes, and has been applied at the hospital. Mr. Sievier's patent webbing is lighter and more porous, which renders it suitable to surgical purposes. Before Mr. Sievier brought his elastic web, I had never seen any made on the same principle.

Cross-examined by *Sir F. Pollock.*—I do not think No. 4 a good specimen of the invention. I consider No. 4 cannot enter into competition with No. 3, for surgical purposes. I do not say No. 4 is not fit for surgical purposes; it is not more suitable than No. 1.

Re-examined by *Mr. Attorney-General.*—I have seen several specimens of No. 3, all on the same principle, and there are some more applicable than others. No. 4 appears to have alternate elastic threads, all in the same plane. No. 4. and No. 3 appear to be formed on the same principle, but are of different density and porosity.

Joseph Rose Holt sworn. Examined by *Mr. Attorney-General.*—I am a surgeon. Mr. Sievier's bandages are better for surgical purposes than any I ever saw before: they may be proportioned to the degree of pressure considered desirable. They are lighter, more porous; they

admit the perspiration to pass through. They are cheaper: I have tried them on several patients, and they have answered well. The specimen would answer in some cases, but not so well as No. 3. The objection to No. 1, is, that you are not able to apply pressure according to your wish.

Cross-examined by *Sir F. Pollock.*—I first had my attention called to this matter within the last six months.

George Frederick Minton. Examined by *Mr. Serjt. Wilde.*—I am a wholesale hosier, and have been extensively engaged in the sale of braces and other articles made of elastic web, since 1833. I am acquainted with the article manufactured under this patent; have known it since April or May, 1833. I never saw articles made on the same plan before that time. I am an agent for the sale of the plaintiffs' manufacture: it has a very extensive sale. The first time I saw any such materials manufactured by others than the plaintiffs' was in October, 1834. The sale of that article has materially interfered with that of the plaintiff.

Cross-examined by *Mr. Creswell.*—I was appointed the plaintiffs' agent, March, 1833.

Richard Hellaby sworn. Examined by *Mr. Serjeant Stephens.*—I am a wholesale lace maker. I deal in elastic web; have done so for two years and a half. I know the web for which Mr. Sievier has obtained a patent. I have purchased largely of the article No. 3. I purchased that kind of web of Messrs. Keene and Co. in 1834. The purchases were by my foreman. I do not remember to have seen it before that time. If it had been in the market I should have been likely to have had it shown to me.

Cross-examined by *Sir F. Pollock.*—I purchased the intermediate web, the same as No. 3, from Messrs. Keene and Co. This is the article (the witness pointed to a striped specimen); it was this article made coarser. I

do not think I ever saw that article before October, 1834. I never saw the article till I saw Mr. Keene's. I had heard of it before that time: so far as I know, there had been no dealings in my shop in elastic articles till three years ago. There have been things bought and paid for that I have not seen.

Re-examined by *Mr. Attorney-General.*—Though I did not give the orders, I saw the goods when they came in.

Samuel Balsden sworn. Examined by *Mr. Attorney-General.*—I am a tailor (some specimens of the woollen cloth made under the patent were shown to the witness). I consider cloth of that fabric might be beneficially used in making clothes for the working people, and would be serviceable for belts. If it were manufactured of finer cloth it would be applicable for many purposes. I never saw similar cloth before the patent.

Cross-examined by *Sir F. Pollock.*—I do not know the price. The utility, even supposing it cost a little more, would do a working man more service. If it were five or six times as dear he would receive five or six times the comfort. A man wearing this would not be confined in his labour. It is useful also in waistcoat sleeves, and such like. I saw it first yesterday, and I gave my opinion that it was a most useful thing for labouring people.

Re-examined by *Mr. Attorney-General.*—I think it would last longer in consequence of its elasticity; it would not be so apt to tear: although I only saw it yesterday, I am sure it would be found serviceable.

John Cook sworn. Examined by *Mr. Attorney-General.*—I am a tailor; I saw that elastic cloth for the first time yesterday; I have been a tailor forty years; I should say that this article would be useful for a variety of purposes—such as the backs and sleeves of waistcoats.

Cross-examined by *Sir F. Pollock.*—I never heard of it before; it was 10 o'clock yesterday (Sunday) night

when I first had my attention called to this article; I am not aware that the specification has been out three years.

John Farey sworn. Examined by *Mr. Attorney-General.*—I am a civil engineer; I have for thirty years paid attention to the manufactures of the country; I have read the specification of Mr. Sievier's patent, and I understand the three objects as described in the specification: I think the first is an useful object—it is for introducing elastic cords of India-rubber, covered with fine threads into the enlarged loops of hosiery goods, stocking-fabrics, to form margins round the upper part of such garments, which, being elastic, closes, which is a decidedly useful invention. It is a new invention, as made of cords covered with a platting of thread used and inserted in the loops of the fabrics itself. There are parts of garments in which the second object of the invention would be useful. There is an elastic fabric now used by sailors which is found to be most advantageous clothing: it is a knitted fabric. If equal elasticity be given to woollen cloth, it would be a great improvement, inasmuch as it is not so porous to wet. This (the second object of the patent) would be equally elastic, and be impervious to water. The third object of the patent is for cloth not to be felted: it is an useful article—very useful; and is the article brought into the most general use: as far as I know, it was new at the time of taking the patent; that is, the threads covered with a platting, and interwoven with ordinary warp threads: those warp threads limit the extension to which the India-rubber should be pulled out; the nonelastic threads limit the elastic power of the whole fabric. The consequence of that is most important, because it enables the least quantity of elastic materials to be used, as those threads are the protection to its being overstrained; without any such protection, a greater quantity of the elastic materials must be substituted. The nonelastic threads being slack, they bear no tension till they are drawn out to a considerable extent, therefore they

do not impair its elasticity, but increase its ultimate strength, and prevent breaking the article previously manufactured, which was wholly composed of the elastic threads, covered with a platting; has this inconvenience, that to give it sufficient strength to resist its being broken, it must have a great deal of India-rubber: this makes the article more expensive, which, after all, is the great thing: it is more rigid, more resisting, without being altogether stronger. No. 1, is composed wholly of elastic India-rubber threads, with a platting and cotton weft to tie them together. No. 2, the India-rubber threads are not covered by a platting, they are covered in the weaving. This has a nonelastic warp used. In No. 2, the object of the nonelastic is to enclose the elastic strand; it makes a sheath. The longitudinal nonelastic threads are used as a covering for the elastic threads—it is a double cloth in fact. There is a cloth at the back of the elastic threads, and in front; and the elastic threads may be drawn out without disorganizing either of these cloths. No. 3, is made with the intervening nonelastic threads, forming a part of the warp, with the elastic threads covered with platting, and nonelastic threads intervening between them, form altogether the warp in the same plane; in fact, in place of being three (as in No. 2) they are one; they constitute one fabric. No. 3, is constructed on a different principle to No. 2 or No. 1, and No 3, is a great improvement.

Cross-examined by Sir *F. Pollock.*—I first had my attention called to India-rubber webbing in 1829-30. I believe it was like No. 1; I was informed it was from France. My attention was first called to this matter with a view to give evidence on Friday; but I have had to attend to the subject generally before. I am aware that, in 1820, Mr. Hancock had taken a patent for the purpose of using a material of that sort in separate cases or sheaths. The first object of the invention is to introduce into stocking-fabric strands or filaments of India-rubber, co-

vered with platting. The specification says, "covered or not; but they must be covered:" I imply that it must be covered. In Hancock's, the sheath was superadded on the fabric after it was finished in Mr. Sievier's; the cord of India-rubber is knitted, and put through certain enlarged loops of the fabric; it is introduced in the making of the fabric itself. I never saw the second object of the patent till the other day (Friday).

Re-examined by *Mr. Attorney-General.*—Would there be any difficulty in dressing that (No. 2) and putting nap upon it? It would be a coarse cloth when done; there would be no difficulty in doing it; I cannot say whether fine cloth could be made; it would require experiment to say; but I think it must be always cloth that has been very lightly felted, that it may be more elastic. In No. 2, the elastic strands are not covered by a platting, they are covered by the cloth.

Mr. Attorney-General.—This is my case, my Lord.

[*To be continued in our next.*]

ORIGINAL PAPER.

Letters-Patent Amendment Act.

In No. XXIV. p. 369, of our Magazine, we published the rules of the judicial committee of the privy council, under the Act 5 and 6 W. 4, c. 83, entitled "An Act to amend the Law touching Letters Patent for Inventions." We now subjoin,

Further Rules to be observed before the Judicial Committee under the said Act.

"A party applying for an extension of a patent under section 4 of the said act, must lodge at the council office four printed or written copies of his specification for the use of the judicial committee. If such specification shall have been printed in some publication, lodging four copies of the publication containing the same will be deemed

sufficient. In the event also of the applicant's specification not having been published as aforesaid, and if the expense of making four copies of any drawing therein contained or referred to would be considerable, the lodging of one copy only of such drawing will be deemed sufficient.

"All copies mentioned in this rule must be lodged not less than one week before the day fixed for hearing the application.

"The judicial committee will hear the attorney-general, or other counsel, on behalf of the crown, against granting any application made under either the 2nd or 4th section of the said act, in case it shall be thought fit to oppose the same on such behalf.

"*Council Office, December* 21, 1835."

Parties preparing to petition under this Act, should be aware of the practice at the privy council-office; it is this, to send copies of all petitions to the solicitors of the treasury, who may, if the case seems to them to require it, instruct the attorney-general to attend, and oppose on the part of the crown and the public, but at the expense of the petitioner.

By the permission allowed of lodging four copies of any publication containing the specification of the patent in question, for the use of the judicial committee, instead of supplying written copies, a very considerable saving may be made by the parties, as by an application to our publisher, the insertion of a specification in our work may, on certain conditions, be obtained. It has been our constant practice, and indeed it has always formed a peculiar feature of our work, to give the specifications *verbatim*, which is not done in any other publication in the kingdom. The garbled accounts which are given in some publications, are not only not to be relied upon, but, if had recourse to as authority, are certain to lead into error and expense.

PROGRESS OF SCIENCE

APPLIED TO THE ARTS AND MANUFACTURES, TO COMMERCE, AND TO AGRICULTURE.

CONSIDERATIONS ON A NEW FORCE ACTING IN THE FORMATION OF ORGANIC COMPOUNDS. BY M. BERZELIUS. (*Jahrbuch de Schumacher, for* 1836.)—When new compounds are produced in inorganic nature as the result of the re-action of different bodies, it is in consequence of a mutual tendency of those bodies to satisfy the laws of their affinity in a more complete manner. First, the substances possessing dominant affinities enter into combination, and then those of feeble affinities which were excluded from the first combination. Before the year 1800, the existence, in these phænomena, of any other determining cause than the degree of affinity, heat, and, in some cases, light, was scarcely suspected. The influence of electricity was then discovered, and we soon saw ourselves in danger of confounding the electrical with the chemical relations of bodies, and of considering their affinities only as the manifestation of a strong electrical contrast, increased by light and heat. This system offered no other means of explaining the origin of a new compound, than by the supposition, that, by the approximation of bodies which are present, their electrical states become neutralized in a more perfect manner.

Setting off from these ideas, deduced from the effects which occur in inorganic nature, and studying the chemical re-actions presented by organized bodies, we perceived that in the organs of the latter, substances the most various were elaborated, while the brute matter, whence they proceeded, consisted, in general, of but one liquid, circulating in vessels with more or less velocity. The vessels of the animal body, for example, pump blood from their origin without interruption, and nevertheless, secrete milk, bile, urine, &c. at their extremities, without admitting any other liquid capable of producing, by double affinity, any

decomposition whatever. A fact here evidently occurs. which the study of inorganic nature was then unable to explain.

At this period M. Kirckhoff observed that, starch dissolved in diluted acid, became converted, at a certain temperature, first into gum, and afterwards into grape-sugar. In conformity with the principles then received with regard to effects of this kind, an endeavour was made to ascertain what the acid had removed from the starch to reduce it into sugar; but no gas had been disengaged, the acid re-appearing by means of the alkalies in its primitive quantity, had not been combined, and the liquid contained only sugar in an equal, or even a larger, quantity than the starch which had been employed. The cause of this alteration was as problematical as that of the secretions in the organic body. M. Thénard then discovered the peroxide of hydrogen, a liquid, the elements of which are retained in combination by a very weak affinity. The acids do not produce any alteration in it; the alkalies, on the contrary, produce in it a tendency to decomposition, a species of fermentation, which re-produces water, in consequence of a disengagement of oxygen. But the most interesting circumstance, is, that the same effect takes place from the action of different solid bodies insoluble in water, organic as well as inorganic; for example, from the presence of peroxide of manganese, of silver, platinum, and also the fibrin of animal blood. The body which determines the decomposition does not undergo any alteration, it does not act as an element of a new compound, but by virtue of a peculiar force inherent in its mass, the existence of which, though unknown in its essence, is demonstrated by its effects. Shortly before M. Thénard, Sir H. Davy remarked another phænomenon, the analogy of which with the one just described, was not immediately perceived. He had proved that platinum, heated to a certain degree, and brought into contact with a mixture of the vapour of alcohol, or ether, and atmospheric air,

possessed the power of determining and sustaining the combination of these bodies, while gold and silver were devoid of this property. Soon after, Mr. E. Davy discovered a preparation of platinum in a state of very great mechanical division, having, at ordinary temperatures, and after being moistened with alcohol, the property of becoming incandescent by the combustion of alcohol, altogether in converting it by oxidation, into acetic acid. Then followed the discovery of Döbereiner, the most important of all. He proved that it is the property of spongy platinum to inflame spontaneously a current of hydrogen gas projected in the air; a phænomenon which the researches of M. M. Thénard and Dulong proved is produced by several other bodies, simple as well as compound: with this restriction, however, that, while platinum, iridium, and some other affinal metals, act at temperatures below zero, other bodies, such as gold, and more especially silver, require a much higher temperature, and glass a heat even of above 300°. Thus what was at first considered as an exceptive mode of action, appeared to be a general property though variously graduated, of all bodies, and from the application of which, advantage might be derived. We know, for example, that in the act of fermentation, in the conversion of sugar into alcohol and carbonic acid, the action exercised by the insoluble substance named leaven, and which may be replaced, though with less success, by animal fibrin, albumen, and caseous substances, &c., cannot be explained by any chemical re-action of the affinities of the sugar and the leaven, and that no effect in inorganic nature approaches it so nearly as the action of platinum, silver, or fibrin in the decomposition of the peroxide of hydrogen into oxigen and water. It was natural here to suppose an analogous mode of action. The conversion of starch into sugar, by means of sulphuric acid, had not yet been co-ordinated with the preceding facts; the discovery however of diastase (announced in the Annual Report for 1833), a substance acting upon

starch in an analogous manner, only with more energy, directed attention to this analogy, which was definitively proved by the ingenious researches of M. Mitscherlich upon the formation of ether. Among the numerous theories upon the formation of ethers, one, we know, makes the property of sulphuric acid to convert alcohol into ether, to depend upon its power of absorbing water, granting, that the alcohol, considered as a compound of one atom of etherine ($C^4 H^3$), and of two atoms of water, is reduced into ether, by ceding the half of its water to the acid. This theory, equally simple and ingenious, was in perfect agreement with our knowledge of the re-action of the affinities of bodies; it did not, however, explain why other bodies not acids, having equal avidity for water, could not be employed in the same manner; why soda, potash, chloride of potassium, anhydrous lime, &c., if the transformation really depended only upon an affinity for water, did not equally produce ether. The researches of M. Mitscherlich proved that sulphuric acid, sufficiently diluted, and taken at such a temperature that the refrigeration produced by the addition of the alcohol, compensated for the heating which arose from the mixture, decomposed the alcohol into ether and water, which, because the temperature exceeded the temperature of ebullition of water, were both separated by distillation from the mass, and, as soon as the condensation was complete, presented a mixture of the same weight as that of the alcohol employed. The manner of performing this experiment, as well as the fact of the distillation of water conjointly with alcohol, was, it is true, known before M. Mitscherlich, but to him belongs the merit of having predicted its consequences. In fact, he proved that at this temperature, sulphuric acid must act upon alcohol by virtue of the same force which determines the action of the alkalies upon oxygenated water, since the water being entirely separated from the mixture, did not obey an affinity for the acid; whence he concluded, that the action of sulphuric acid and diastase upon starch,

from which resulted the sugar, must be of the same nature.

It is then proved that many substances, simple or compound, solid or in solution, have the property of exercising an influence upon compound bodies essentially distinct from chemical affinity, an influence which consists in the production of a displacement and a different arrangement of their elements, without participating in it directly and necessarily, except in a few special cases. Certainly a force such as this, capable of producing chemical re-actions in inorganic nature, as well as in organized bodies, though at present too little understood to be well explained, must exercise a more important function in nature than has hitherto been supposed. In defining it as a new force, I am far from wishing to deny that a certain connection exists between it and the electro-chemical relations of matter. I am, on the contrary, strongly disposed to recognize in it a decided manifestation of these relations; nevertheless, till we have penetrated into the real nature of this force, it will be more simple in our future researches to consider it as independent, and to give it, for facility of recognition, a name peculiar to itself. According to an etymology well known in chemistry, I shall consequently name it the *catalytic force* of bodies, and the decomposition which it determines *catalysis*, in the same manner as the separation of the elements of a compound, by means of the usual chemical affinities, is called *analysis*. This force may be defined to be a power of bodies to bring into activity, by their simple presence, and without participating in it chemically, certain affinities, which at that temperature would remain inactive, so as to determine, in consequence of a new distribution of the elements of the compound, a new state of perfect chemical neutralization. As this force acts in general in a manner analogous to heat, it may be inquired whether being variously graduated, sometimes by employing differently the same catalytic body, sometimes by the introduction of various catalytic bodies in the same liquid,

it will cause, as is often observed in the action of heat at different temperatures, different catalytic products,—whether the catalytic force of a body can be exerted over a larger number of compounds, or whether, as our experiments appear to indicate, only over certain bodies, to the exception of certain other bodies? But in the present state of our knowledge it is impossible to decide these questions, and many others that might be proposed upon the subject: their solution must depend on the results of future investigations. It is enough for the present to have shewn, by a sufficient number of examples, the existence of this force, which, defined as it has been, diffuses a new light over the chemical re-actions of organized bodies. We shall cite but one example. There is an accumulation of diastase around the eye of the potatoe, which is not found in the tubercle or in the developed germ; we perceive in this point a centre of catalytic action, at which the insoluble starch of the tubercle is converted into gum and sugar, and this part of the potatoe will become the secretory organ for the soluble substances, which are to form the juices of the growing germ. It is not probable that the action mentioned is the only one of its kind in vegetable life; on the contrary, it may be presumed, that in vegetables, as well as in the animal body, a thousand catalytic effects take place between the tissues and the liquids, whence results the great number of different chemical compounds, the production of which, from the same brute manner, which we call blood, or vegetable juices, cannot be explained by any other known cause.—*Bibliothèque Universelle, Nouv. Ser. Tome ii., p.* 376. A. T.

NOTICE OF EXPIRED PATENTS.

(*Continued from p.* 56.)

Franz Areton Egells, of Britannia Terrace, City Road, Middlesex, Engineer, for certain improvements on steam-engines.—Sealed November 9, 1821.

James Gardner, of Banbury, Oxfordshire, Ironmonger, for a machine preparatory to melting in the manufacture of tallow, soap, and candles, and which machine may be used for other similar purposes.—Sealed November 9, 1821.

John Bates, of Bradford, Yorkshire, Machine Maker, for certain machinery for the purpose of feeding furnaces of every description, steam-engines, and other boilers, with coal, coke, and fuel of every kind.—Sealed November 9, 1821.

William Westley Richards, of Birmingham, Warwickshire, Gun Maker, for an improvement in the construction of gun and pistol locks.—Sealed November 10, 1821.

William Penrose, of Stummorgangs, Yorkshire, Miller, for various improvements in the machinery for propelling vessels, and in vessels so propelled.—Sealed November 10, 1821.

Bowles Symes, of Lincoln's Inn, Middlesex, Esquire, for an expanding hydrostatic piston, to resist the pressure of certain fluids, and slide easily in an imperfect cylinder.—Sealed November 10, 1821.

Joseph Grout, of Gutter Lane, Cheapside, London, Crape Manufacturer, for a new manufacture of crape.—Sealed November 13, 1821.

Neil Arnott, of Bedford Square, Middlesex, M.D., for improvements connected with the production and agency of heat in furnaces, steam and air engines, distilling, evaporating, and brewing apparatus. —Sealed November 14, 1821.

Richard Macnamara, of Canterbury Buildings, Lambeth, Surrey, Esquire, for an improvement in paving, pitching, and covering streets, roads, and other places.—Sealed November 20, 1821.—*(For copy of specification, see Repertory, Vol. 42, second series, p. 329.)*

John Collinge, of Lambeth, Surrey, Engineer, for an improvement on hinges.—Sealed November 22, 1821.

Henry Robinson Palmer, of Hackney, Middlesex, Civil-Engineer, for improvements in the construction of rail-ways and tram-roads, and of the carriage or carriages to be used thereon.—Sealed November 22, 1821.

Thomas Parkin, of Skinner Street, Bishopsgate Street, Middlesex, Merchant, for an improvement or improvements in printing.—Sealed November 24, 1821.

LIST OF NEW PATENTS.

John Roberts, of Prestolle, in the parish of Prestwich, and county of Lancaster, Calico Printer, for certain im-

provements in the art of block printing.—Sealed June 27, 1836.—(*Six months.*)

Bennett Woodcroft, of Ardwick, in the parish of Manchester, in the county of Lancaster, Gentleman, for an improved mode of printing certain colours on calico and other fabrics.—Sealed July 2, 1836.—(*Six months.*)

William Wainwright Potts, of Burslem, in the county of Stafford, China and Earthenware Manufacturer, William Machine, of Burslem, aforesaid, China and Earthenware Manufacturer, and William Bourne, of Burslem, aforesaid, Manager, for an improved method or process whereby impressions or patterns in one or more colours or metallic preparations are produced and transferred to surfaces of metal, wood, cloth, paper, papier machée, bone, slate, marble, and other suitable substances prepared or otherwise, not being used as earthenware, porcelain, china, glass, or other similar substances.—Sealed July 2, 1836.—(*Six months.*)

Samuel Meggitt, of the town of Kingston-upon-Hull, Master Mariner, for certain improvements in anchors, and in apparatus for fishing such improved anchors, which improvements may respectively be adapted to anchors now in common use.—Sealed July 2, 1836.—(*Six months.*)

Robert Walter Swinburne, of South Shields, in the county of Durham, Agent, for certain improvements in the manufacture of plate glass.—Sealed July 4, 1836.—(*Six months.*)

John Isaac Hawkins, of Chase Cottage, Pancras Vale, in the Hampstead Road, in the county of Middlesex, Engineer, for an improvement in the art of manufacturing iron and steel. Communicated by a foreigner residing abroad.—Sealed July 4, 1836.—(*Six months.*)

William Southwood Stocker, of Birmingham, in the county of Warwick, Machinist, for improvements in machinery applicable to the making of nails and other purposes.—Sealed July 7, 1836.—(*Six months.*)

Matthew Heath, of Furnivals' Inn, in the city of

London, Esquire, for new mechanical combinations for obtaining power and velocity applicable to the propelling of vessels, raising water, and to machinery of various descriptions. Communicated by a foreigner residing abroad. —Sealed July 11, 1836.—(*Six months.*)

Elisha Haydon Collier, of East India Cottage, City Road, in the county of Middlesex, formerly of Boston, in the State of Massachussets, one of the United States of North America, Civil Engineer, for an improvement or improvements in steam-boilers.—Sealed July 13, 1836. —(*Six months.*)

Miles Berry, of 66, Chancery Lane, in the parish of St. Andrew's, Holborn, in the county of Middlesex, Mechanical Draftsman, for certain improvements in machinery or apparatus for forming staves for barrels, casks, and other purposes. Communicated by a foreigner residing abroad.—Sealed July 13, 1836.—(*Six months.*)

Louis Matthias Horliac, late of Paris, but now residing in the Haymarket, in the county of Middlesex, Gentleman, for certain improvements in carriages and harness. Communicated by a foreigner residing abroad. —Sealed July 13, 1836.—(*Six months.*)

Oliver Bird, of the parish of Woodchester, in the county of Gloucester, Clothier, and William Lewis, of Brunscomb, in the parish of Stroud, in the said county, Clothier, for certain improvements in machinery applicable to the dressing of woollen and other cloths requiring such process.—Sealed July 13, 1836.—(*Two months.*)

John Ericsson, of Brook Street, New Road, in the county of Middlesex, Civil Engineer, for an improved propeller applicable to steam navigation.—Sealed July 13, 1836.—(*Six months.*)

William Essex, of Cheetham, near Manchester, in the county of Lancaster, Agent, for improvements in machinery for producing rotary motion.—Sealed July 13, 1836.—(*Six months.*)

Samuel Brown, of Boswell Court, Carey Street, in

the county of Middlesex, Engineer, for certain improvements for generating gas, which improvements are also applicable to other useful purposes.—Sealed July 14, 1836. —(*Six months.*)

CHARLES PHILLIPS, of Chipping Norton, in the county of Oxon, Surgeon, for improvements in drawing off beer and other liquors from casks or vessels.—Sealed July 14, 1836.—(*Six months.*)

JOHN ERICSSON, of Brook Street, New Road, in the county of Middlesex, Civil Engineer, for certain improved machinery to be used in the manufacturing of files.—Sealed July 20, 1836.—(*Six months.*)

CHARLES WHEATSTONE, of Conduit Street, in the county of Middlesex, Musical Instrument Manufacturer, and JOHN GREEN, of Soho Square, in the same county, Musical Instrument Manufacturer, for a new method or methods of forming musical instruments, in which continuous sounds are produced from strings, wires, or springs.—Sealed July 27, 1836.—(*Six months.*)

JOHN HALL, of New Radford, in the county of Nottingham, Lace Manufacturer, for certain improvements in certain machinery for the purpose by such improvements of facilitating the operation which is commonly called dressing, or getting up, or finishing of large pieces of lace nets of various kinds whereof some are called bobbin net, or twist net, and other kinds are called warp net and fittings.—Sealed July 27, 1836.—(*Six months.*)

PETER SPENCE, of Henry Street, Commercial Road, in the county of Middlesex, Chemist, for certain improvements in the manufacture of Prussian blue, prussiate of potash, and plaster of Paris.—Sealed July 27, 1836.—(*Six months.*)

CHARLES BRANDT, of Belgrave Place, Pimlico, in the county of Middlesex, Gentleman, for an improved method of evaporating and cooling fluids.—Sealed July 27, 1836. —(*Six months.*)

THE

REPERTORY

OF

PATENT INVENTIONS.

No. XXXIII. NEW SERIES.—SEPTEMBER, 1836.

Specification of the Patent granted to Rowland Hill, *of Tottenham, in the County of Middlesex, Gentleman, for certain Improvements in certain Methods of Letter-Press Printing by Machinery.*—Sealed February 12, 1835.

WITH AN ENGRAVING.

To all to whom these presents shall come, &c. &c.,—*Now know ye*, that in compliance with the said proviso, I, the said Rowland Hill, do hereby declare, that my said invention is described and ascertained in manner following, and by the aid of the nine sheets of drawings hereunto annexed, (that is to say):

My said improvements relate to those methods of letter-press printing by machinery which operate by means of cylinders revolving continuously, that is to say, wherein the letter-press types from which letters are to be printed by pressure are arranged around, and affixed to, a revolving cylindrical roller (which may be called the type-cylinder), in such manner that the printing surfaces of those types will conform to the whole or part of a supposed cylindrical surface which is truly concentric with

the axis or central line whereon the type-cylinder is to revolve, and a suitable inking apparatus with revolving inking rollers, being so placed in respect to the type-cylinder as to supply ink to the said printing surface thereof whilst the type-cylinder is revolving and another cylindrical roller (which may be called the platten-cylinder), and which may be covered with soft blanket, being placed with its axis exactly parallel to the axis of the type-cylinder, and with such a proximity of the platten-cylinder to the type-cylinder as is suitable for bringing the paper which is to be printed in contact with due pressure against the inked printing surfaces of the types on the type-cylinder. In this state of things the paper being passed around a portion of the circumference of the platten-cylinder at that side thereof which nearly faces the type-cylinder, and the two cylinders being caused to revolve continuously with an exact conformity of motion of their respective surfaces, they will pass the paper through between them, and it will become printed by pressure of the inked surface of the printing types in so passing through, the paper being sustained during that pressure by the blanket-covered surface of the platten-cylinder; and a continual succession of paper being thus passed, every part of the inked type which forms the printing surface of the type-cylinder will in succession be brought in contact with the paper, so as to print thereon an impression of all the types which are arranged around the cylindrical surface of the type-cylinder, wherefore at every succeeding revolution of the type-cylinder another succeeding impression of all the types upon it will be printed on a succeeding portion of paper.

And whereas the above method of printing by machinery, which operates by means of cylinders revolving continuously, is in general use for printing calico with ornamental patterns. And whereas the said method was proposed for letter-press printing by machinery with moveable types, arranged around a type-cylinder, by Mr.

William Nicholson, in a specification inrolled in pursuance of letters patent which were granted to him on the 29th day of April, 1790, but on account of deficiencies and imperfections in the machinery described in that specification, the same has never been practised or brought into use. And whereas machinery was brought to bear for letter-press printing with stereotype plates bended to a cylindrical surface, instead of moveable types, by Mr. Edward Cowper, under letters patent granted to him on the 10th day of January, 1816, and such machinery has been used to some extent.

Now my present improvements in the said methods of letter-press printing by machinery which operates by means of cylinders revolving continuously, are as follows:

First.—An improvement in the aforesaid methods of letter-press printing by machinery for the purpose of securely fastening, side by side, in the manner hereinafter described, a series of moveable printing types, with their printing surfaces in conformity with the whole, or part, of a true, but supposed, cylindrical surface, so as to form a revolving type-cylinder, such type-cylinder being somewhat similar to that which Mr. Nicholson aimed at constructing, as stated in his specification aforesaid, but with the improvement of having the types so firmly fastened and retained in place around such type-cylinder as will be suitable for letter-press printing by the method hereinbefore mentioned (and particularly by the aid of the improvements hereinafter described), with machinery consisting of cylinders revolving continuously.

Secondly.—An improvement in the methods of letter-press printing by machinery for supplying ink to revolving cylindrical printing surfaces, the improvement being to gather and take off the ink continually and without intermission from the surface of a slow revolving cylindrical roller, upon which surface the ink is previously spread in a thick coat, by the usual means of what is called an ink-trough and ductor in ordinary printing machinery,

the said gathering and taking off being performed in manner hereinafter described by a quicker revolving cylindrical roller applying its quick moving surface in contact with the slow moving surface of the other roller, called the ductor roller, whereon the thick coat of ink is spread, and by means of that difference between the motions of the surfaces the said thick coat of ink is extended and spread out in a thin attenuated coat upon the quick moving surface, but which by that means becomes covered with uniformity, and with a suitable quantity of ink for being transferred by a series of revolving rollers of the usual kind to the printing surfaces of the types on the revolving type-cylinder, so as to keep the same inked continually in an uniform and proper manner.

Thirdly.—An improvement in the aforesaid methods of letter-press printing by machinery for the purpose of feeding the same with paper, and introducing that paper into the machinery in a suitable manner for being printed thereby, the improvement being to supply the paper from a scroll consisting of a very long continuous piece of paper, such as is commonly made by modern paper-making machines which have drying machines annexed to them, the paper made thereby being gathered or rolled up around reels in scrolls, which are afterwards cut up into a great number of sheets of paper; one end of the long piece of paper constituting such a scroll being introduced into the machinery so as to pass around a portion of the circumference of the platten-cylinder, and so as to become thereby subjected to pressure of the inked surface of the type-cylinder, when the same and the platten-cylinder are turned round with corresponding continuous motion, whereby the said paper will be drawn off and unwound from the scroll, and passed through the machinery, which will print one impression after another on the paper, at different succeeding portions of the length thereof, without any cessation or intermission of the printing operation until the whole scroll of paper is printed with a scrics of

repetitions of the same impression, in a similar manner to that commonly practised for printing pieces of calico in cylinder machinery; and as fast as the paper has become printed and has passed out through the machinery, it may be rolled or gathered up around a reel in a scroll corresponding to that from which the blank paper was drawn off, and after the paper has been printed on one of its sides or surfaces in that manner, the scroll may be removed to another like machine, whereof the type-cylinder is suitably prepared for printing the opposite side or surface of the paper, so that the scroll being presented to that machine, in like manner as it was to the first machine, except having its contrary surface turned towards the type, and, being passed through the second machine, the paper will become printed a second time on the opposite side or surface to that which was first printed; or instead of thus using another machine the type-cylinder of the same machine, after the required number of impressions have been printed by it on one side of a series of scrolls of paper, may then have types newly arranged upon it, suitably for printing the second side of the paper, by submitting the scrolls of once-printed paper to a second operation of the same machinery. Or otherwise, the type-cylinder by which the paper has been printed on one side may be removed from the machine when the required number of impressions have been printed on one side of the several scrolls of paper, and another type-cylinder suitably prepared for printing the second side of the same paper, may be put into the place of the first type-cylinder, in order to print the scrolls of paper a second time on the opposite side thereof to that which was first printed. Or otherwise, the type may be disposed on the type-cylinder in such manner that one-half of the cylindrical surface thereof will contain the type whereof the impression is to occupy one side or surface of each of the separate sheets or leaves of paper into which the scroll is ultimately to be cut up and divided, and the other half of

that surface will contain the type whereof the impression is to occupy the opposite surface of each of the said sheets or leaves of paper. And after passing the scrolls of paper once through the machine, so as to print one side or surface thereof, then one-half of the impression thereon will consist of pages or columns which are to be on one side or surface of the leaves of paper, and the other half will consist of pages or columns which are to be on the opposite sides of those leaves. The paper being so printed on one side and gathered up again in a second scroll, the same paper may then be replaced at the front of the same machine, without alteration of that machine, and the end of the once-printed paper may be introduced into the machine as before, but with its contrary surface turned towards the type, and in such manner that although the impression which is to be made at this second operation on the contrary side of the paper will be precisely the same as was made at the previous operation on the former side; nevertheless, in consequence of the arrangement of the pages or columns of the types upon the surface of the type-cylinder, and the reversing or turning of the paper with its contrary surface turned towards the type, at the second time of subjecting it to the machine, all those pages or columns of each impression which are intended to occupy opposite sides of the several leaves into which the scroll of paper is ultimately to be divided, will become printed at their proper places on the scroll to correspond properly with the pages or columns which, on the opposite side of the same sheets or leaves of the paper, have been previously printed at the first time of passing the paper through the machinery. By which means, when the twice-printed paper is afterwards cut up into separate sheets or leaves, each such sheet or leaf will have the intended impressions at its two opposite sides.

Fourthly.—An improvement in the aforesaid methods of letter-press printing by machinery for cutting up the aforesaid long continuous pieces or scrolls of printed paper

before-mentioned, into separate sheets or leaves, at the completion of the printing of the respective portions of that paper, by machinery which operates as aforesaid, by cylinders revolving continuously. The machinery for effecting this part of the improvements may be of the same nature with that which is now very commonly applied to the modern paper-making and drying machinery for the purpose of cutting up the paper, which is made thereby, into sheets or leaves. The said cutting machinery being so connected with the printing machinery, as that a cutting off of the paper (or two or more such cuttings off if required) shall be made for every revolution of the type-cylinder; the moment of cutting being correctly timed to the revolving motion of that cylinder so as to divide the paper at the proper intended places between the repetitions of the impressions which have been previously made by the type-cylinder on the paper.

And note, respecting the third and fourth articles of my improvements, the same are not of necessity connected with my improvements set forth in the other articles of improvement, for although I prefer to supply the paper from a scroll containing a long piece of paper, nevertheless detached sheets of paper may be supplied to machinery for letter-press printing, which operates by cylinders revolving continuously, and which machinery is, in other respects, constructed according to my improvements, the requisite mechanism for assisting the persons who feed the machinery with detached sheets of paper, and for introducing those sheets properly into the machinery, being the same as is commonly used in ordinary printing machines, forms no part of my invention, and such mechanism is so well known to persons conversant with printing machinery as to require no particular explanation.

Fifthly.—An improvement in the aforesaid methods of letter-press printing by machinery, by means of which improvement both sides of the paper may be printed

whilst the same is passing once only through the said machinery; for this purpose, the machinery must be provided with two type-cylinders, each with its own inking apparatus, and likewise its own platten-cylinder, so as to combine the parts of two machines, such as hereinbefore mentioned, into one combination of machinery, having suitable wheel-work and connections for producing a cotemporaneous revolving motion of all the several cylinders, in such manner, that the paper being passed through between one of the type-cylinders and the platten-cylinder corresponding thereto, and having received the impressions of the types of that cylinder on one side of the paper, the same will then, in the course of its further progress through the machinery, pass between the other type-cylinder and its corresponding platten-cylinder, in order to be printed thereby on the contrary side of the paper. The latter type-cylinder must have the types suitably arranged upon its surface for printing that contrary side of the paper, and also the said last-mentioned type-cylinder must be so situated, in respect to the first-mentioned type-cylinder, that the paper, in passing through the machinery, will apply with one of its surfaces to one of the type-cylinders, and will then apply with its opposite surface to the other type-cylinder, whereby the paper will become printed on both sides before it leaves the machinery.

Sixthly.—An improvement in the aforesaid methods of letter-press printing by machinery, by which improvement two impressions are respectively printed upon two distinct papers, at one and the same time, from the types which are fixed around the same revolving type-cylinder, which must for that purpose be provided with two distinct inking apparatuses, in order to apply ink to the printing surfaces of the type at opposite sides of the circumference of the said cylinder, and the type-cylinder must be provided with two platten-cylinders, one situated above it, and the other below it; and one of the said papers which

are to be printed may be applied to the under part of the type-cylinder so as to pass between the same and that platten-roller which is beneath the type-cylinder, in order to receive an impression of the types, at the same time that the other paper may be applied to the upper part of the type-cylinder, so as to be passing between the same and that platten-roller which is above the type-cylinder, in order to receive an impression of the types; wherefore, by this means, the same set of types which are disposed around the surface of the same type-cylinder, will give one impression on one paper at every time that by the revolution of that type-cylinder, the types thereof go down to their lowest position, and will also give another impression from the same types on another paper every time that they go up to their highest position, and previous to making each such impression the said types are duly inked in passing from one position to the other. By this means twice as many impressions can be obtained in any given time, as would otherwise be obtained with the same rapidity of motion of the machinery, because two impressions are made for every time that the type-cylinder goes once round; and this part of the improvements may be applied either to a simple machine, which contains only one type-cylinder for printing only one side of the paper at a time, which machinery will, by aid of this part of the improvements, make two impressions of all the type that is applied around the said cylinder for every revolution of that type-cylinder, those impressions being on one side of the paper. Or this part of the improvement may be applied to a compound machine, such as is mentioned as the fifth article of these improvements, with two type-cylinders, for printing on both sides of the paper in passing the same only once through the machinery, each of the type-cylinders being provided with two inking apparatuses and two platten-cylinders, and in case of the latter application, three distinct papers may be passing through the machinery at the same time, viz., one paper

which is passed in the manner mentioned in article fifth, with one of its sides in contact with one type-cylinder, and then with its other side in contact with the other type-cylinder, whereby that paper becomes printed on both sides. Another paper, which is passed over one of the said type-cylinders, between the same and its uppermost platten-cylinder, will become printed on one side, viz., its undermost side. And another third paper, which is passed under the other type-cylinder, between the same, and its lowermost platten-cylinder, will also become printed on one side, viz., its uppermost side. The said two last-mentioned papers, after being thus passed through the machinery, and printed each on one side only, are then made to exchange places one with the other, and are put through the machine again with the same side of each paper uppermost, in order to print the other side of each paper, that is to say, the paper above-mentioned which became printed on its undermost side by being passed over one of the type-cylinders, will, at the second time of passing the once-printed paper, be passed under the other type-cylinder, in order to receive an impression therefrom at its opposite side. By this arangement the machinery will print at the rate of two perfected impressions, printed on both sides of the paper, from all the type that is contained on both the type-cylinders, for every revolution that those cylinders make.

And note, respecting the fifth and sixth articles of my improvements, the same are not of necessity connected with the third and fourth articles, because the paper may be supplied to the machinery in detached sheets, by aid of such mechanism as is commonly used for introducing the paper into ordinary printing machines, and which mechanism, as before-mentioned, forms no part of my invention.

And note, all my said improvements, after the first article, are applicable to the method of letter-press printing by machinery which operates by means of cylinders re-

volving continuously, with stereotyped plates bended to a cylindrical surface and fastened around a type-cylinder, after Mr. Cowper's method before-mentioned, instead of moveable types fastened around a type-cylinder, but such mode of bending and applying stereotyped plates forms no part of my invention.

Having now ascertained the nature of my improvements, I shall proceed to describe, by the aid of the drawings hereunto annexed, the manner in which the same are to be performed, and for clearness of explanation, the several articles of improvement are treated separately, in the order hereinbefore stated:

Description of the Drawing.

First, respecting that part of the improvements whereby a series of moveable printing types are fastened around a type-cylinder. The said types may be cast in a mould in the usual manner practised by type founders, the mould being rather differently formed, as shewn in sheet I, in order that the stems of each letter of the type may be made tapering in one direction, being rather narrower at the tail end of each stem than at the letter end of the same stem, so that the two sides of the stem are inclined to each other instead of being exactly parallel as in ordinary type, the tapering of the stems being such as will qualify the type for being imposed or placed with their tail ends upon a cylindrical surface, instead of a plane surface, and when so placed that the inclining sides of the stems will tend exactly to the centre line of the cylinder, and the printing surface of the type, or face of the letter, will form another larger cylindrical surface, exactly concentric with the said centre line of the cylinder.

But note, although the stems of the types are thus made tapering in one direction, they are made parallel as usual in the other direction, the parallel sides being those which are formed by parallel flat surfaces of the two halves of the mould, which halves separate from each other in order to withdraw the type, as shewn at A and B, in sheet I. The parts, *a*, *b*, and *b*, *j*, of the interior of the mould, which interlock with each other when the two halves of the mould are put together, and which are made straight in ordinary type moulds, are made curved to the arch of a circle. The usual side cheeks, *d*, *e*, of the mould, which are to form the inclining sides of the type, are fixed so as tend exactly towards the centre of circular curvature, and owing to the mutual interlocking of the two halves of the mould, being made by

the usual prominent gauge-pieces, *f*, *g*, and *h*, *i*, fitting upon and including between them the curved edges, *a*, *b*, and *b*, *j*, (in lieu of straight edges as usual in ordinary moulds,) the side cheeks, *d* and *e*, will always continue to bend towards the said centre, although they may be placed nearer to or farther apart from each other, suitably for the width of the letter which is to be cast, that width being determined as usual in ordinary moulds by the width of the copper matrix, which is stamped with the hollow for forming the letter, and which is inserted between the outermost gauge-pieces, *g* and *i*, of the two halves of the mould when they are put together. And the mould also contains a circularly curved prominence, *m*, on one half, with a corresponding cavity, *n*, on the other half for receiving it; when the two halves are put together the said prominence occupies part of the cavity left in the mould for the reception of the melted metal, and will occasion a broad but shallow notch to be formed across the stem of each type, which notch answers in some respects to the notches which are made across the stems in ordinary printing types, but the said notches, according to my improvement, are much wider, being adapted to receive small binding slips of metal, by which the type are to be retained in place on the type-cylinder. The form of the finished type is represented in sheet II., the aforesaid notches being marked *q*, and the setting up of type, cast in the manner above-described (and which is represented in sheet II.), being the manipulation which is termed composition by printers, is to be performed in the usual manner of composing with ordinary printing types, excepting that the compositor is to use a composing stick, represented in sheet II., which is curved at the bottom or sole-plate, D, whereon the root ends or tails of the types are to stand, the curvature being a cylindrically curved surface, whereof the radius is less than the radius of the intended cylindrical printing surface by the length of the type, and the sides or cheeks, E and F, of the said composing stick, are planes which tend towards the centre-line or axis of the said cylindrical curvature, and one of the said cheeks, F, of the composing stick is moveable, as usual in ordinary composing sticks, for adapting the same to the intended length of the lines. And when a line of letters has been composed by setting up types side by side in the composing stick, in the manner usually practised by compositors, the notches, *q*, before-mentioned, across the stems of several types will range one with another so as to form a curved groove or channel all the length of the line, which line being finished, the compositor must insert a curved binder-strip of thin metal plate, *r*; which is adapted exactly to fill the said groove, and then he proceeds to set up and compose another succeeding line of letters in his composing stick. And note, at the ends of each such binder, *r*, small prolongations, *s*, *s*, are left projecting a little way

beyond the ends of the binder, and the extremities are bended at right angles to the flat plane of the binder so as to form a small hook. The use of the said hooked projections, *s*, *s*, is two-fold: they serve to prevent the binder from dropping between the lines of type by resting on the upper edges of the cheeks, E and F, of the composing stick, and, after the removal of the type to the chase or galley, by resting on the upper edges of the two sides of such chase or galley, and they also assist, as will be explained hereafter, in securing the lines of type in their places on the type-cylinder. The said curved binders, *r*, are completely inlaid into the notches of the type, which notches are made of sufficient depth to receive the binders, so that the stems of the types of succeeding lines will come in contact laterally, both above and below their notches, *q*, the same as in ordinary type. The binders which are thus inlaid between each succeeding line of types, secure and lock every individual type, so as to retain it from being drawn endways, or dropping out of its place between the other types among which it is set up. And note, Mr. Nicholson, in his specification of 1790, directs the type to be rendered tapering, by scraping the stems in a finishing stick, after the type has been cast in the usual manner, but he did not invent any means of binding such types together; and the formation of a suitable notch, *q*, across the stem of each type, and the application of binders, *r*, thereon, for the purpose of fastening such types together for letter-press printing by a type-cylinder, is part of my present invention. And in order to apply the type which is so composed upon a type-cylinder for letter-press printing by machinery, the type required for forming each page of the intended printing may be included within a metal frame, called a chase, of a size to suit the page, such as is represented at G, H, I, K, sheet III., each such chase being composed of two sides, G, H and two ends, I, K, all made on one piece of metal, or else of pieces very solidly fastened together like one. The ends, I, K, are curved to suit the cylindrical form of the type-cylinder upon which they are to be applied, in the manner shewn in sheet I. The sides, G and H, although parallel to each, are bevelled, so that their sides tend to the centre line or axis of the type-cylinder, and thereby the interior of the chase is rendered suitable for receiving the type. The projecting ends, *s*, *s*, at the ends of the several binders, *r*, *r*, between the lines of types are lodged upon the sides, G and H, of the chase, in the same manner as before-described respecting the composing stick, and in order to fasten the type into the chase, a moveable end, L, is applied across one end of the interior of each chase having a small tenon at each extremity, which tenons are received into notched grooves made for their reception in the inside surfaces of the sides, G and H, of the chase, and the said moveable end, L, is forced up endways towards the type by two

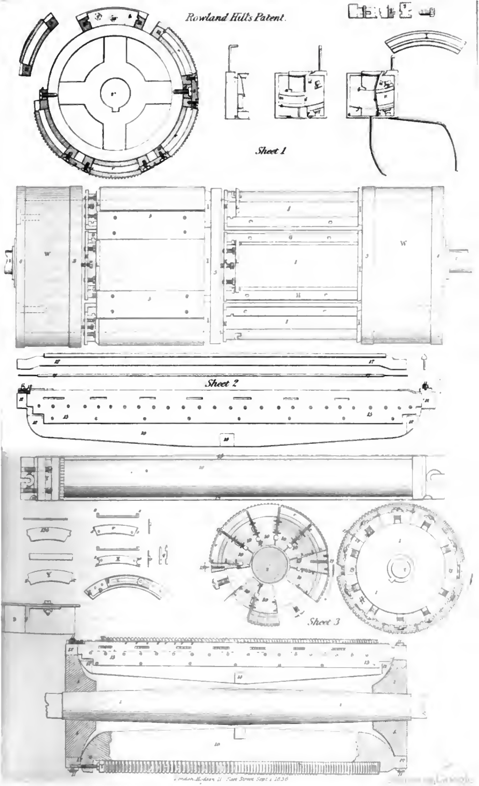
screws, *t*, *v*, which are tapped through the end, K, of the chase, with holes across the heads to turn them by, and those heads press against the moveable end, L. At the time the chase is being filled with type, it must be placed either on the bare surface of the type-cylinder or in a cylindrical surface of equal curvature, the sides of the chase being placed parallel with the axis or central line of such cylinder or cylindrical surface. The type for each page of the intended printing being thus secured in chases, a number of such chases of type may be affixed around a type-cylinder, such as is represented in sheet I., and which is a plane roller or cylinder, 1, 1, of cast-iron, mounted on an axis, 2, 2, and truly turned on its external circumference, without any projection or flanges, being hollow within for lightness, with arms at each end to fix it on its axis, 2. And in lieu of projecting flanges, circular rings or belts of iron or steel, 3, 3, 3, are truly turned to fit upon the outside of the cylinder, 1, 1, without being fixed thereto, wherefore they can be placed at any part of the length of the cylinder; and after the said rings are put on, and flanges, 4, 4, are applied at each end of the cylinder, being flat circular iron plates fitted on a projecting central boss at each end of the cylinder, and firmly fastened to the ends of the cylinder by screws, strong straight pieces of wood or iron, 6, 6, of a length suitable to the required distances of the rings, 3, 3, 3, from each other, and of equal thickness with those rings, are screwed firmly into the cylinder in two straight lines extending from one ring to another the whole length of the cylinder, and in opposite sides thereof. These straight pieces assist in fixing the rings at proper distances from one another. The rings, 3, 3, 3, have circular grooves excavated in each of their flat annular surfaces, and one end, I, of each chase has a projecting tenon extending its whole length to enter into these grooves, and also the opposite end, K, has a screw, *w*, tapped through it, with a taper-stump point adapted to enter into the circular groove, around the ring, 3, when that screw is screwed outwards from the chase, and as it enters the groove to press rather against its upper side; by which means the chase may be firmly fastened upon the cylinder without perforating the surface thereof with any screw-holes for fastening it. The tails or root-ends of the types rest upon the cylindrical surface of the cylinder, and the printing surfaces of the types form a cylindrical surface, and according to the number of pages which are required to be printed on one side of one sheet of paper, or as much paper as is to be cut into one sheet and afterwards folded, so the chases are to be arranged around the type-cylinder in order to cover its cylindrical surface.

The drawing, sheet I, represents six chases, applied in a circle around the circumference of the cylinder, and two such sets applied end to end, but as these two sets do no not fill the length of the cy-

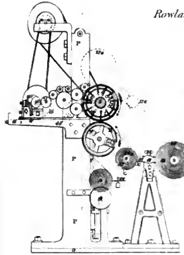
linder, blockings of wood, w, w, are inserted at each end, between the end flanges, 4, 4, and the rings, 3, 3, to diminish the length suitable for two sets. This representation is only by way of example, the number of chases making up the whole surface will of course depend on the size of the cylinder and that of the page. And note, for ordinary book printing the type-cylinder should be rather larger than is represented in sheet I. If it is made twenty-six inches in length, between the end flanges, 4, 4, and ten inches and three-quarters diameter, for the cylindrical printing surface of the types (which is nearly thirty-three and three-quarters inches circumference), it will suit all, or nearly all, the sizes required. And in order still further to secure the type in the several chases from dropping out, or becoming loose therein, thin metal rulers, 5, 5, may be applied along each side, G, H, of each chase, and fastened thereto by screws. The edges of those rulers are rebated so as to overlap the hooked projections, *s*, *s*, at the ends of the binders, and which ends, *s*, *s*, rest upon the sides, G, H, of each chase, and they are confined thereto by the rebated edges of the several rulers, 5, 5. The said rulers, 5, 5, are made broad enough to overlap the sides, G, H, of two adjacent chases, so as to serve for securing the ends, *s*, *s*, of the binder, *r*, in both chases, and each ruler being fixed by screws to both chases, they also serve to fasten the several chases at their proper distances asunder around the type-cylinder, so as to leave the proper spaces for margins. These particulars being understood of the method of imposing and fastening the types upon the type-cylinder, for letter-press printing, in pages having spaces between for margins, as is usual for books, I shall proceed to explain the method which is suitable for letter-press printing of newspapers and other sheets consisting of long columns without blank spaces or intervals therein, and the columns being also very close, side by side, without any considerable intervals between each column and the next. The form of a type-cylinder for that purpose is represented in sheet III. The central axis, 2, 2, has a circular disc, 1, 1, firmly fixed upon each end of it, and around those two discs, the ends of a series of strong bars of cast-iron, 10, 10, are applied, the bars fitting together side by side, like the staves of a cask, and each bar being supported at each end, without touching the axis, 2, although they reach very near thereto, but they derive support from lateral contact with each other at their ends at 12, 12, and also at the middle of the length of each bar where there is a slightly prominent part, 14, for making that contact. The ends of all the several bars, 10, 10, are fastened to the circumferences of the discs, 1, 1, by one screw, 11, for each end of each bar, which screws are fastened into the discs so as to radiate out therefrom, and they pass through holes in the ends of the several bars, and have nuts screwed on their outermost ends, to confine the

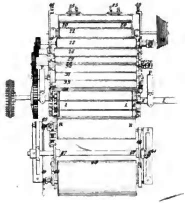
bars on the discs and to each other, the nuts being countersunk flush into the substance of the bars. The cylinder thus formed of staves or bars is truly turned in a lathe to a proper size for the root ends of the stems of the type to rest upon, with a projecting flange at each end to retain the ends of the columns of type, the outer circumference of those flanges being rather less than the cylindrical printing surface which is to be formed by the letters on the faces of the types. By unscrewing the nuts of the screws, 11, 11, the bars can be removed from the cylinder, one at a time, or any one bar can be removed or replaced independently of all the others. The breadth of each bar is adapted to the width of the intended columns of printing. The drawing represents twelve bars, composing the circumference of the turned type-cylinder, two of those bars marked 13, 13, are narrower than the others, not being intended to receive type, but they are placed at the intervals which correspond with the margins at the sides of the two sets of columns which constitute the two large pages or side of the folio newspaper, each of those large pages having five columns situated close to each other. And on each side of each bar, 10, a thin brass plate, 15, 15, is fastened by several small screws, so as to project up above the turned surface whereon the roots of the types are to stand, in order to form boundaries to the ends of the lines of type whereof each column is composed, wherefore each bar, 10, becomes a trough suitable for receiving a column of type, and I call each one a galley, that being the term used by printers for a kind of trough to contain a column of type. The two sides of each trough or galley, which are formed by the plates, 15, tend to the central line of the type-cylinder suitably for including the lines of type between them, and their upper edges are at a suitable height for lodging the hooked projections, *s*, *s*, at the ends of each binder, *r*, in the same manner as hereinbefore-mentioned respecting the sides of the composing stick, and the sides, G, H, of the chase. And note, the side-plates, 15, 15, are included in spaces left between the adjacent edges of the several bars, 10, the lateral contact of those bars being confined to the places marked 12, 12, and 14. And in order to retain the type securely in such galleys, slits are cut in the plates, 15, 15, at intervals in order to receive small tenons, *x*, *x*, at the ends of particular binders, made of steel or other strong metal which are marked X, in sheet II.; those tenons being in addition to the hooked projections, *s*, *s*, of the same binders, which excepting those additional tenons are exactly like all the other binders in form, and at about every two or three inches in the length of the column of type, which is placed in the galley. One of the binders, X, is substituted for one of the ordinary binders, *r*, and by introducing the binder, X, obliquely across the width of the galley, one of its tenons, *x*, is first entered into of the

Rowland Hill's Patent.



Rowland Hill's Patent





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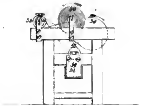

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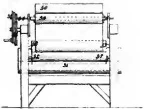
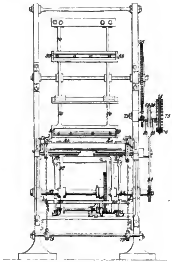
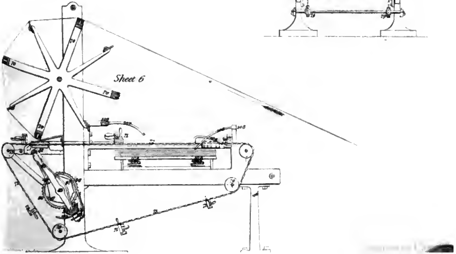




Sheet 6



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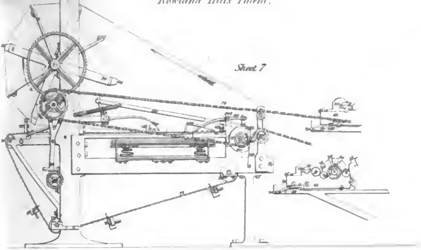
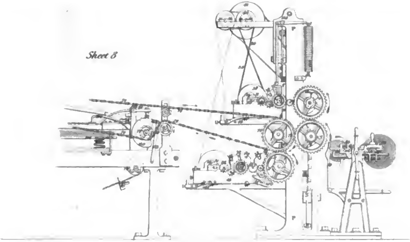
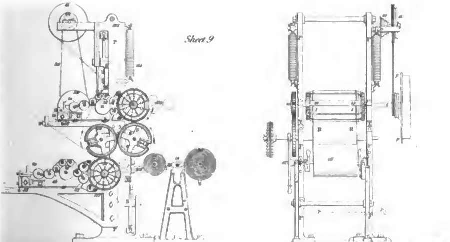


Sheet 7



Sheet 8



Sheet 9

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slits in one of the side plates, 15, and then the other tenon, *x*, is entered into the other slit of the opposite side, plate 15, as the binder is inserted into its proper place in the notches of the type. By means of such tenoned binders, the particular lines of type where they are inserted will be secured in place; and the whole column of type being compressed by two binding screws, 16, 16, at the end of the galley, the intervening lines of type will be held to each other by their lateral contact. The screws, 16, 16, are tapped through a projection at the end of the galley, and are turned by polygonal heads which press against a fitting piece of iron, Y, applied across the end of the column of type, and it has two tenons, *x*, *x*, to enter into the slits in the two side-plates, 15. The pressure of the end of screws, 16, 16, will in some cases be found sufficient to hold the column in its place without the use of the particular binders, X; but such binders are useful as affording greater security, and also for further security against any of the lines of type becoming loose in the galley, thin plates, 17, may be inserted into the narrow space left between every two adjacent side-plates, 15, of the several galleys, and the plates, 17, have prominent beads along both sides of each plate, in order to overlap the hooked projections, *s*, *s*, of all the several binders, *r*, which are interlaid between all the lines of type, in the same manner as before-described respecting the rebated edges of the rulers, 5; wherefore the plates, 17, hold all the said projections, *s*, *s*, down upon the edges of the side-plates, 15, of the galleys, and thereby retain the binders, *r*, in place, as well as the types between which they are interlaid, and the outermost edge of each of the plates, 17, may be suitably formed for printing a division-line between the several columns of printing if such lines are required, in which case the said outermost edges of each plate, 17, must be exactly conformable to the cylindrical printing surface of the type. The plates, 17, are confined in their places by means of a screw, 18, at each end of each, one of which screws are tapped into the ends of the galleys, and have broad but flat heads overhanging the ends of the plates, 17, a portion of each head is cut away on one side to admit the end of the plate, 17, to be inserted in place, and then by turning the screw round, the overhanging part of the head will confine the plate, 17. The two bars, 13, 13, of the type-cylinder, which are not galleys to contain type, may have pieces of wood or metal fitted upon them to receive rulers, 19, which have rebated edges to overlap the hooked projections, *s*, *s*, of the binders, *r*, in order to confine them, the rulers, 19, being similar to the rulers, 5, before-explained, and applying to the outermost columns of each page of the newspaper, which columns are separated to leave the blank margins of the paper. Revolving type-cylinders with moveable types fastened around them, in manner above-described, may be used

for letter-press printing by machinery, and the type will be securely retained in place during the operation of such cylinder. The mode of applying such a type-cylinder for letter-press printing by machinery, may be varied, but the mode which I recommend is represented in sheet IV. The type-cylinder, 1, 1, is mounted with its axis, 2, in a horizontal position, in suitable bearings which are supported by strong uprights, P, P, of the frame, and a winch or handle, *p*, may be fixed on the end of the axis, 2, to turn it round by. Or otherwise, in lieu of a handle, suitable wheel-work for turning the machinery by mechanical power, of mill-work, in the same manner as ordinary printing machinery is actuated. And a platten-cylinder, R, is disposed either above or below the type-cylinder, having its axis parallel to that of the type-cylinder, and mounted in bearings, *q*, *q*, which are sustained by the same uprights, P, P; the platten-cylinder, R, may be covered with a soft blanket wrapped round its circumference, and the paper which is to be printed is applied upon that surface when it is subjected to the pressure of the type, by passing between the type-cylinder and the platten-cylinder. The inking apparatus, which consists of a series of revolving rollers covered with ink on their surfaces, may be disposed in any suitable position in respect of the type-cylinder for forming contact with the printing surfaces of the types whilst that surface revolves by the motion of the type-cylinder. The platten-cylinder, R, allowing for the blanket, is made of the same diameter as the cylindrical printing surface of the types, and the two cylinders are caused to turn round with an exact conformity of revolving motion by means of two equal spur cog-wheels, M and N, one fixed upon the axis, 2, of the type-cylinder, and the other upon the axis of the platten-cylinder. And in order to admit of removing the platten-cylinder, R, from its proximity to the type-cylinder, 1, 1, (when the machine is not in the act of printing,) the bearings, *q*, *q*, for the axis of the platten-cylinder, are fitted to the uprights, P, P, of the frame, so as to be capable of sliding up and down by action of eccentrics, S, S, which are mounted on strong cross centre-pins borne by the uprights, P, P, and by turning those eccentrics, the bearings, *q*, *q*, can be forced towards the type-cylinder. The two eccentrics, S, S, have long lever arms to turn them round by, and the said arms of both the eccentrics are connected by a cross link, T, which being moved end ways will turn both eccentrics so much as is requisite for urging the platten-cylinder, R, towards the type-cylinder, suitably for printing, or by a contrary motion of the link, T, the platten-cylinder can be removed from the type-cylinder when it is required to adjust the types or make other preparations for the operation of printing. The revolving motions of the inking apparatus are derived by toothed wheel-work from the spur-wheel, M, on the end of the axis of the type-cylinder. And note, stop-screws are

provided for limiting the motion of the bearings, *q*, *q*, of the platten-cylinder towards the type-cylinder, so as to keep the cylindrical surfaces of the two at such a distance from each other as is suitable for printing, with an adequata pressure of the types against the paper, allowing for the yielding of the soft blanket covering of the platten-cylinder, R; and if necessary, circular wooden bearers can be placed one at each end of the type-cylinder, and one also at each end of the platten-cylinder, the said circular wooden bearers being of such equal diameter, and being so placed that their circular surfaces shall press against one another when the machine is at work; and packing composed of many thicknesses of pasteboard, may be interposed at V, between the sliders which are moved by the eccentrics, S, S, and, the sliding bearings, *q*, *q*, for the axis of the platten-cylinder, in order that such packings may yield a little if any extraordinary force tends to separate the cylinders from each other. A notch may be left in the circumference of the platten-cylinder, in order to fasten on its blanket covering in the usual manner, the notch being at that part which will come opposite to the vacancy in the type which surrounds the type-cylinder, and which in printing leaves the blank interval between the successive impressions which are made by each revolution of the cylinders. The paper may be fed to the revolving cylinders, sheet after sheet, by means of suitable apparatus for assisting the person who attends the machine to introduce the sheets correctly, in a similar manner to the feeding of other letter-press printing machinery, and endless bands of tape circulating over suitable pullies may be employed to conduct the paper between the cylinders and deliver it out from them when printed, all which being no part of my invention, and being commonly known, requires no further explanation; my improvement for feeding the machine with paper will be hereinafter explained. The paper which is printed by the machinery, such as is represented in sheet IV., will only become printed on one side by passing through the machinery, and the printing of the contrary side must be done by a second operation.

Secondly, respecting that part of the improvements whereby ink is supplied to the revolving cylindrical printing surfaces of letter-press printing machinery. The inking apparatus, see sheets IV. and IX., consists of a series of revolving cylindrical rollers, placed parallel one to the other, with their surfaces in contact, and the ink is transferred repeatedly from one to another, in order to become very evenly distributed upon their surfaces, and is then supplied to the printing surfaces of the types on the revolving type-cylinder by two soft rollers which make contact with the types at two succeeding places during the revolution of the type-cylinder in order to ink the types very completely, because any partial deficiency of inking by one of those soft

rollers, will be snpplied by the other. The first supply of ink is obtained from au ink-trough, 20, and a ductor-roller, 21, both of the ordinary kind, which dnctor-roller has a comparatively slow motion; the ink is received from the ductor-roller by a second metal roller, 22, which revolves quicker, so as to cause a gentle rubbing of its surface against the snrface of the ductor-roller, 21, and thereby it takes away the ink in a more extended and thinner film than can be left spread upon the surface of the roller, 21, by the edge of the ductor. The metal roller, 22, is caused to move backwards and forwards endways in its bearings, at the same that it revolves, in order that it may more completely cover itself with the thin film of ink, which it takes away from the ductor-roller, 21. The metal roller, 22, communicates the ink which it has so taken to a soft roller, 26, made of a composition of glue and treacle, in the nsual manner of the soft inking rollers used in ordinary printing machines. And the soft roller, 26, transmits the ink again to a larger wooden or metallic roller, 28, which has also an endways motion, in order to cause au uniform distribution of the ink upon it, and for the purpose of completing that distribution, two soft rollers, 29 and 30, are applied over the large roller, 28, to squeeze gently upon the ink and spread it on the surface, which, as it revolves, carries the ink round to the two soft rollers, 31, 32, which apply to its inky surface, and deriving an evenly-distributed supply of ink therefrom transfer the same to the printing surfaces of the types around the revolving type-cylinder, 1, 1, the same types deriving a first snpply of ink from the roller, 32, and then again a second supply from the other roller, 31, in order to make sure of a sufficient inking, but without laying on too great a quantity at once: and 33, is another soft roller, applying its soft surface to the inked surfaces of the types for completing the distribution of the ink which has been previously applied to them by the two rollers, 32 and 31. The several inking rollers are turned round in the directions indicated by arrows in the drawings, by means of toothed-wheel work deriving motion from the spur-wheel, M, on the extreme end of the axis, 2, of the type-cylinder, 1. The wheel, M, turns an intermediate pinion, 34, which is mounted on a stud centre-pin fixed to the frame of the machinery, and the pinion, 34, turns a spur-wheel, 35, on the axis of the large roller, 28, to give motion thereto, and that wheel by an intermediate pinion, 36, which is mounted on a stud centre pin fixed to the frame of the inking apparatus turns a pinion, 37, on the end of the axis of the roller, 22. The diameters and numbers of teeth of all the said toothed wheels and pinions, are suitably adapted for causing the cylindrical surfaces of the several rollers to move with the same rapidity as the printing surface of the type cylinder moves with. The soft rollers have no wheel work to turn them, but they derive motion from the

surface with which they are in contact, the first inking roller, 21, is turned round very slowly by means of an endless band, 39, encompassing a pulley, 38, on the end of its axis, and the band, 39, also encompasses another pulley, 40, on an axis which is mounted in a small frame affixed to the frame of the machine, and that axis has a larger pulley, 41, fixed upon it, which receives motion by another endless band from a small pulley on the axis, 2, of the type cylinder, wherefore the rotatory motion is reduced in its transmission by the bands to the roller, 21, in such manner that the surface thereof will move with only about one-twentieth part the rapidity of the motion of the surface of the roller, 22, against which it operates (or that the surfaces of the other rollers, and of the printing surface of the type cylinder move with. But that proportion can be varied by means of several grooves of different sizes which are formed around the pullies, 38, and 40, and the endless band, 39, being applied in one or other of those grooves, will cause the roller, 21, to be turned with a greater or lesser speed than the said proportion of one-twentieth part, and by that means the quantity of ink which will be communicated to the roller, 22, and thence to the types can be graduated at pleasure. The setting of the ductor by its setting screws, 25, can be regulated so as to modify the supply of ink, although it would be very difficult if not impossible to reduce the flow sufficiently if the surface of the ductor roller, 21, had as rapid a motion as that of the other inking rollers. By combining the adjustment of the ductor with the adjustment in the rate of motion of the ductor-roller, 21, the flow of ink from the trough may be regulated with great precision, while, at the same time, the supply being communicated uninterruptedly through means of the intermediate rollers to the large roller, 28, (instead of being laid down in patches, as is the case in many machines which use a carrier roller to take ink from the ductor roller to the inking table), the ink, by the method which I employ, requires but little further distribution before it is ready to be laid on the types. The bearings in which the axis of the roller, 21, are sustained, as well as the bearer bar, 24, for the ink trough and ductor, are fitted to the sides of the frame in which the inking apparatus is mounted, so as to be capable of adjustment by setting screws, 42, in order to regulate the contact of the surface of the ductor-roller, 21, with that of the roller, 22. The roller, 22, is moved backwards and forwards endways in its bearings, by means of a worm or spiral groove having two contrary obliquities formed around a piece, 43, which is fixed on one of its axes. The groove winding round it in one direction of obliquity for one or two turns, and then returning with a contrary obliquity, and crossing its former course and joining again into itself. A forked piece situated between the axis, enters into this groove, and being mounted on an upright centre stud-pin

fixed to the frame; the action of the fork in the oblique groove causes the axis and the roller, 22, to move endways in its bearings, until the returning obliquity of the groove coming to the fork, causes it to move endways in a contrary direction, the fork turning about on its fixed centre-pin so as to accomodate itself to the change of obliquities. The larger roller, 28, is moved endways in like manner, but to a less extent, by a similar worm, 44. The toothed wheels and pinions by which the rollers, 28 and 22, are turned round, are so broad on their edges as not to lose their hold of the other wheels in consequence of the said endway motions. The frame of the inking apparatus consists of two side plates, 45, placed edgeway upwards, with notches in them to form bearings for the axis of the several inking rollers to revolve in. The two side plates, 45, are united together by the cross-bar, 24, on which the ductor is supported, and also by two cross-bolts, 46, so as to constitute a firm frame, the whole of which is mounted like a carriage on four truck-wheels, 47, which run upon those two horizontal railway-bars, 48, which are fixed to the frame of the machine. The whole inking apparatus may be wheeled away or withdrawn from the type-cylinder, when the machine is in course of preparation for printing, but, when it is prepared, the inking apparatus can be wheeled forwards into its place, with its three soft rollers, 31, 32, 33, applying with gentle contact to the type. The carriage is retained by a latch, 49, which has a setting screw to regulate that contact. The bearings for the axis of the soft rollers, 31 and 32, are capable of regulation, by setting screws, to regulate their contact with the roller, 28, and with the type. And note, the revolving roller, 21, with its ink-trough and ductor, 20, and setting screws thereto for spreading a regulated film of ink on the roller, and then transferring that ink in a continuous supply to other soft rollers, and by them applying it to the types, forms no part of my invention, the same being described by Messrs. Bacon and Donkin, as applied to machinery which operates with a revolving type-roller of a prismatic form but not a cylinder, in a specification which they enrolled in pursuance of a patent granted to them the 23rd day of November, 1813, and the same method has since been practised. My improvement thereon is in the method above explained, by means of which the thick film of ink which has been so spread out on the surface of such a ductor-roller, is taken away by the contact of another revolving roller whereof the surface moves so much quicker as to spread out and attenuate the original film to any required degree of thinness which is suitable for transferring to the type in such quantity as they require, and which quantity can be regulated by varying the speed wherewith the ductor-roller is moved in respect to the other roller which takes off the film of ink from the ductor-roller by moving

quicker as aforesaid in a regulated proportion of relative motion. The endway motion given to certain rollers also forms no part of my invention, a similar arrangement having been adopted in many printing machines.

[*To be concluded in our next.*]

Specification of the Patent granted to WILLIAM WAINWRIGHT POTTS, *of Burslem, in the County of Stafford China and Earthenware Manufacturer, for an Improved Method or Process of producing Patterns in one or more Colours, to be transferred to Earthenware, Porcelain, China, Glass, and other similar Substances.* —Sealed December 3, 1835.

WITH AN ENGRAVING.

To all to whom these presents shall come, &c. &c.—*Now know ye*, that in compliance with the said proviso, I, the said William Wainwright Potts, do hereby declare that my said invention is ascertained and described in the manner hereinafter expressed and appearing by the method most commonly used by manufacturers of earthenware, porcelain, china, glass, and other similar substances (all of which, to avoid repetition, I shall hereinafter refer to as included under the term "earthenware and glass"), for producing patterns to be transferred to those substances, the required patterns are engraved on a flat plate of copper, from which an impression in the colour required is taken on tissue-paper laid over the plate, and subjected to the pressure of rollers, as in the ordinary process of copper-plate printing, and the pattern thus obtained on the paper is transferred to the surface of the earthenware or glass intended to receive it in the method now usually practised. In the year 1831, John Potts, Richard Oliver, and myself, invented an improved method or process of obtaining impressions from engravings in various colours, and applying the same to earthenware, porcelain, china,

glass, and other similar substances, for which we obtained His Majesty's letters patent, bearing date the 17th day of September, 1831, and a specification of which was duly enrolled in His Majesty's High Court of Chancery, pursuant to a proviso in the last-mentioned letters patent contained, and by which invention we were enabled to obtain impressions of the before-mentioned nature from engravings, either on cylindrical copper rollers or flat plates, in considerable quanties, with much less expenditure of time and labour than is required by the method in common use. The before-mentioned methods were however confined to the obtaining of impressions from engravings, that is, from plates or rollers in which the pattern is cut, indented, or depressed, below the general surface of the plate or roller, and the colouring matter being received in the cut, indented or depressed parts is thence impressed on the paper. It is evident that by this operation a pattern in one colour only could be produced, as the application to the paper of a second or subsequent engraved plate or roller would necessarily injure or destroy the impression already received from the first or preceding one.

The nature of my invention consists in the substitution of what is termed "surface printing," in the place of printing with engraved plates or rollers for impressing patterns on paper to be transferred as aforesaid, that is, in the employment of rollers, blocks, or other implements for impressing patterns or figures, on which the pattern or figure to be produced is raised up or in relief instead of being cut out, indented, or depressed, and the colouring matter instead of being received in, and impressed from the cut, indented or depressed parts is applied to, and received from, the raised or elevated surface, and may be illustrated by the difference between copper-plate engravings and wood cuts. By this method patterns may be produced either in one or several colours; each part of the pattern which is intended to be of a separate colour being formed

on a separate roller or block, the different parts of the pattern being placed on the respective rollers or blocks with such exact local relation to each other, that the several impressions may confine to form the complete pattern required. Thus after the first part of the pattern has been impressed on the paper by one roller or block in one colour, a second, third, or other additional part, each in a different colour, may be impressed by successive rollers or blocks, for as those parts only of each block or roller which are raised to form part of the pattern come in contact with the paper, the impression produced by a preceding roller or block is unaffected by any succeeding roller or block, the raised parts of which fall upon a different part of the paper to impress another portion of the pattern.

Having thus stated the general nature of my invention, I shall describe the various modes in which the same may be practised, and I shall first describe my mode of working by means of a machine resembling, with some adaptations and additions, the surface printing machine used by calico printers, being the mode which I consider most generally useful.

The following description of such a machine for impressing patterns with two colours is illustrated by, and has reference to, the figure or drawing hereunto annexed, which represents a view of one end thereof, and the parts of the machine as viewed at the other end will be understood to correspond unless otherwise expressed. The scale of the drawing is marked thereon. The width of the machine will vary according to the work intended to be produced by it, but I consider a machine of the width of twenty eight inches between the two ends of the cast iron frame, A, hereinafter mentioned, as being the most suitable for general purposes. In order to avoid, in the following description, the multiplied use of the same letter or number of reference, when referring to several similar or corresponding parts marked with the same

letter or number, I declare that by a reference to any single letter I intended to refer to, and designate all the parts, if more than one, marked therewith in the drawing.

Description of the Drawing.

A, is the strong cast iron frame of the machine, as seen at the end here represented. The two ends are united by cross pieces and bolts in the usual manner well known to all persons conversant with such machines; B, the large bowl or cylinder fixed on an axis, the ends of which work in sliding steps, one of which is seen at, G, which may be raised by screws, one of which is seen at, G^1; C, a mandril of wrought iron made hollow so as to be heated internally by the admission of steam or otherwise; the ends of the mandril are reduced so as to form shoulders which work in grooves or steps in the frame, A. C^1, a plain copper roller accurately fitted to and fixed on the mandril, C, D; and, D^1, two surface rollers fitted to and fixed on solid mandrils, the ends of which work in steps, J, J^1, seen at this end of the machine in corresponding ones at the other end. These steps slide in grooves in the upper surfaces of the flanged pieces, *e*, and e^1, which ride on and are screwed to the horizontal arms of the frames or brackets, M, M^1, and the sliding steps are made to advance towards or recede from the large bowl or cylinder by screws, *d* and d^1, working in uprights which rise from the respective pieces, *e*, and e^1. E, a large toothed wheel fixed on the axis of, and revolving with the cylinder, B, at this end only of the machine. This wheel is driven by the hitting-in wheel, F, and drives the hitting-in wheels, F and F^2. The hitting-in wheels, F, F^1, and F^2, are fixed on the ends shewn in the drawing of the mandril, C, and surface rollers, D, and D^1, respectively (but without any corresponding wheels at the other end). All the hitting-in wheels must be of the same size, pitch, and number of teeth. H, four composition rollers to supply the surface roller, D, with colour. These

rollers are of wood mounted on iron shafts or axles, and covered with coats or layers of composition as hereinafter mentioned. The iron shafts or axles of the rollers project at each end, and run in centres or steps in the pedestals, *h*. The feet of the pedestals are slotted and fastened with nuts and screws to a plank or shelf, *p*, supported at each end by and screwed to an arm or bracket, M. I, a wood roller revolving in the colour box, K, and thence furnishing colouring matter to the composition rollers. L, a straight edge or docter to scrape off any excessive quantity of colouring matter from the wood roller previous to the colour being communicated to the adjacent composition roller. This docter is of the same extent in length as the wood roller, and is held at each end by the upper arm of a lever, *m*, which is suspended on a pivot or fulcrum, supported by a small pedestal on the edge of the colour box, as seen in the drawing. To the lower arm of the lever, *m*, is attached a cord passing over the pulley, *n*, and supporting a weight, *o*, by which the force with which the docter bears on the wood roller may be adjusted. H^1, I^1, K^1, L^1, m^1, n^1, and o^1, are a similar set of composition rollers, furnishing roller, colour box, docter, lever, weight and pulley, for furnishing and regulating the supply of colour to the surface roller, D^1. M M^1, brackets with long horizontal arms extending from the cast iron frame, A, to the upright post or pillar, N. These brackets and pillar occur at each end of the machine. The pillars are connected and kept steady by cross pieces. The horizontal arms of the brackets support the ends of wooden planks or shelves, *p*, p^1, extending across the machine, and on which are mounted the pedestals of the composition rollers, the colour boxes and adjuncts. P, a roller supported by pivots at each end, working freely in centres in the brackets, (9), projecting from the upper part of the frame, A. On this roller a continuous sheet of sized paper of indefinite length is rolled or lapped ready to be drawn down when required. Q, is an endless

blanket of the kind commonly used by calico printers, passing under the cylinder, B, and over the guiding rollers, R. The machine is worked by a power wheel fixed on the end of the mandril, C, outside of the wheel, F, and driven by a pinion fixed on a shaft carried by proper bearings attached to the frame, A, and actuated by an endless band or other suitable contrivance in any of the usual modes. This power wheel and its adjuncts are, for the sake of distinctness, omitted in the drawing. The mode of operating with this machine as used by me is as follows:—Having procured paper of the kind generally used by manufacturers of earthenware and glass for transferring patterns, and which I obtain in sheets of indefinite length, I prepare it by sizing it with the size generally employed for this purpose. The sizing (which forms no part of my invention) may be effected in any usual and suitable manner, but I adopt, as best suited for my purpose, the mode of sizing and rolling the paper described in the specification of the before mentioned invention of John Potts, Richard Oliver, and myself. The roller on which the paper is lapped is then placed in the situation shewn at, P, in the drawing. The cylinder, B, must be made to bear on the copper roller, C^1, with a due degree of force by means of the adjusting screws, G. The roller C^1, being heated by the admission of steam into the mandril, C, or by other suitable means, the outer end of the sheet of paper on the roller is then drawn down in the direction of the straight arrow, and under the cylinder band fastened in an even position to the blanket, Q. The machine being set slowly in motion, the revolution of the cylinder brings the paper to bear on the upper surface of the heated roller, C^1, by which the paper, which yet remains wet from the sizing, is dried, smoothed, and fitted to receive the colour to be imparted to it on its coming in contact with the surface roller, D. The revolution of the cylinder continuing the paper is carried forward to the surface roller, D, which is now pressed up to the cy-

linder, and at the same time the toothed wheels, E, and F¹, are brought into geer, and the situation of the surface roller, D, and its hitting-in wheels, F¹, adjusted and secured by the screws, *d*. This adjustment being effected, the composition rollers, H, with their colour box, and other adjuncts, are properly arranged and fixed on the shelf, *p*, supporting them, which is placed on and screwed to the horizontal arms of the brackets, M, so that the composition rollers may transmit a due and regular supply of the colouring matter from the colour box to the surface roller, D, and whilst the docter, L, prevents the furnishing of an excessive quantity of colouring matter, the intervention of the series of revolving rollers, H, secures its due distribution in an even layer. The friction of the surface-roller, against the adjoining composition roller, and of the composition rollers and wooden roller, I, against each other, will, in general, be found sufficient to give them the due rotary motion, but if this should, under any circumstances, be found insufficient, the revolution of the rollers may be secured by a train of toothed wheels fixed on the ends of the rollers, or any other customary mode of transmitting rotary motion. The revolution of the cylinder being continued, the paper is brought up to the surface roller, D¹, when a further adjustment takes place to secure the due arrangement of the different parts of the pattern. For this purpose each of the rollers, D, and D¹, has a small raised point or mark called a pitch-pin, which gives an impression to the paper, so that the impression which the paper receives from the pitch-pin on the roller, D, may determine the precise point of contact at which the roller, D¹, must be made to bear on the paper by its pitch-pin corresponding with such impression. This being ascertained the roller, D¹, and its hitting-in wheel are adjusted accordingly, and the composition rollers, H¹, and their colour box and adjuncts arranged in like manner as before described. This adjustment requires particular care on the part of the superintendent, as upon it depends the

accuracy of the pattern when different parts are impressed from successive rollers. The adjustment of the machine being now complete, its working continues without interruption, the continuous sheet of paper (after being dried and smoothed by the heated roller, C¹), receiving from the roller, D, the impression of part of the required pattern in one colour, and thence proceeding and receiving from the roller, D¹, the impression of the remainder of the pattern in another colour, and being thence carried with the blanket into an upper room or other place where it is detached and cut off for use in the ordinary manner. I have, for the sake of simplicity, described this machine as furnished with surface rollers, and their adjuncts for printing two colours only, but it will be obvions that a greater number of surface rollers may be employed, and the number of colours accordingly increased. The necessary additions to, and variations in, the arrangement of the machine for this purpose will be supplied and effected by any competent mechanic. If the number of surface rollers be materially increased, it may be necessary to employ a cylinder of greater circumference. In the constructing and working of the machine above described, it must be seen that the several surface rollers are of exactly equal circumference, and that their hitting-in wheels are of a size and pitch in the teeth to correspond exactly with the large wheel on the end of the cylinder, any defect in which will prevent the surface rollers from working truly together, and consequently render impossible the due arrangement and fitting together of the several parts of the pattern. The colouring matter employed is the same as is generally used by manufacturers of earthenware and glass, and prepared in any of the usual modes. For surface printing it should be used cold instead of being heated as when employed in obtaining impressions from engraved patterns, and should also be much thinner as to consistency; I prefer it rather thicker than printers ink. The rollers, H, and H¹, consist of wooden rollers or mandrils

mounted and fixed on iron shafts or axles, and covered externally with a coating of composition about half an inch thick, which is cast on the wooden rollers or mandrils in moulds made for the purpose; the composition is made and is cast on the rollers in the same manner as in the construction of the composition rollers used by letter-press printers. The relative situation of the several composition rollers connected with each surface roller may be altered and adjusted, as occasion may require, by means of the nuts and screws which attach the pedestals to the plank or shelf by which they are supported, and as each series of composition rollers, with the colour-box and furnishing roller appertaining, can only be used for one and the same colour whenever a change of colour is required, the entire set of colour rollers, box, and adjuncts, may be removed with the plank or shelf to which they are attached, and another set substituted in their place.

In addition to the method of producing patterns from the surface by the machine and process I have described, the same principle may be carried into effect by the use of blocks applied by the hand, similar to those used by calico printers in block printing, or by means of presses such as are used by letter-press printers (and in which either blocks or types may be used), and in these cases the colouring matter is furnished or applied to the surface of the blocks or types by composition rollers, having handles, and applied by the hand as practised by letter-press printers, and the same principle may also be carried into effect by other similar means, in which the coloured pattern is received on the paper from the surface of the impressing substance. Although my process of producing patterns for the purpose before mentioned is in itself complete and adequate for the production of patterns in one or more colours, yet it may, with great advantage, be employed in combination with any of the modes now in use of producing patterns from engravings for the purpose aforesaid. When this is done the en-

graved pattern must, for the reasons before stated, be first impressed on the paper, and may be either itself in one of the intended colours, or only an outline or shading in black or other dark tint to define or give different degrees of depth to the coloured parts afterwards to be applied from surface rollers, blocks, or other impressing surfaces, either by the machine before described, or by any of the other means before adverted to. And it will be observed that when a pattern produced on the paper by these combined means is transferred to the earthenware or glass, the outline or shading which was first impressed will be on the outer surface of the transferred pattern, in consequence of which the effect will be found much better than that resulting from the mode in ordinary use, of first transferring to the earthenware or glass, the engraved outline or shading, and then laying on the colours with a pencil or brush applied by hand to the earthenware or glass, which in a greater or less degree impairs and renders muddy and indistinct the appearance of the outline or shading, particularly if the colours so laid on are not transparent after being fired in the oven or kiln. Such a combination may be best effected in the machine I have described by substituting for the plain copper roller, c^1, an engraved roller heated in the same manner, and which will therefore at once perform both the offices of drying the size paper, and of giving the outline shading or part of a pattern required, and whenever this is done such engraved roller must be furnished with a colour box, and furnishing roller, and with a docter and adjuncts as shewn in the drawing at, N, and O, in dotted outline, the colour box having a hollow bottom to allow of heating by the admission of steam or other suitable means, the engraved roller requiring the colour to be applied warm. But I do not claim such use of an engraved roller as any part of my present invention, or as of right to be used therewith, the production of impressions from such engraved roller by such a machine as aforesaid for the

purpose of being transferred as aforesaid, being part of the said invention secured by the said letters patent granted to the said John Potts, Richard Oliver, and myself as aforesaid, and the use thereof in combination with my present patent, being therefore subject to the rights of the patentees under such former patent. The first outline shading or part of a pattern, may however be obtained from flat plates in the manner now usually practised by manufacturers of earthenware and glass, and in some cases this will be found the cheapest and most convenient plan. The outline or shading may also be obtained from a surface roller or block, on which the required outline or shading must be raised in fine lines, or points, as in the method adopted by calico printers for producing the finer lines or parts of patterns printed from surface rollers or blocks. If a surface roller is used for this purpose it may be placed in the situation of the copper roller, c^1, and that roller placed at some other convenient situation as at, z, so that in all cases the paper may in the first place be acted on by the heated copper roller to dry and smooth it. The outline or shading, or the first part of the pattern, may also be obtained by the common process of lithography, the paper being first sized and prepared as herein mentioned or referred to, when a principle portion of the required pattern has been obtained by a first impression, and only few or small parts are required to be filled up, the latter may be done by blocks applied by hand or by a type press; and I prefer this plan in such cases to the employment of the surface roller machine before described. The comparative eligibility of the different modes which I have described of practising my invention will, however, in every case depend on the nature of the pattern to be produced, and will vary according to the taste or judgment of the operator. It will be observed that patterns when transferred to the earthenware or glass appear in the same position as upon the roller, block, or other surface, and not re-

versed as in letter press or copper plate printing. This is only material where letters or other figures are used, the right position of which is essential to the intended effect, and must then be provided for accordingly. In all surface printing it must be borne in mind, that the sized paper must be properly dried and smoothed before it receives the impression, and where the machine I have described is not used, and where the first impression is not obtained by a method which produces in itself the effect of drying and smoothing the paper, I recommend the employment of a machine for the sole purpose of drying and smoothing the paper, consisting merely of two rollers bearing against each other, one of which should be heated by steam or other suitable means, and the other covered with cloth or blanket to press the paper against the heated one, but the construction of such a machine is too simple and obvious to require a particular description; I have not considered it necessary to describe or delineate in the drawing the method or apparatus for heating the mandril, D, or colour box, N (where used). These objects may be effected by any suitable and convenient means, but those which I employ and prefer are the same as are described in the specification of the before-mentioned invention of John Potts, Richard Oliver, and myself, for the like purposes, and which, as they form no part of my invention, I do not hereby describe. Having thus described my said improved method or process, I do hereby declare that I do not claim as of my invention, all or any part of the machine or machines, apparatus, or implements, which I have described or mentioned as necessary or proper to be used in the practice of my said method or process, the same having been by me described solely for the purpose of explaining the nature and mode of practising my said invention; but I claim as of my invention, the method or process of producing by the employment, adaptation, and use of the machine or machines, apparatus, and imple-

ments hereinbefore described, or any other suitable machine or machines, apparatus, and implements, patterns in one or more colours to be transferred to earthenware, porcelain, china, glass, and other similar substances, so as such patterns be obtained from the surface, and not from the engraved cut, indented or depressed parts of the roller, block, or other implement employed as the immediate agent of impressing or transmitting the coloured pattern to or on the paper, the manner of performing which method or process as practised by me, I have hereinbefore set forth, and I claim such method or process only as the means of producing patterns for the sole purpose of being transferred to earthenware, porcelain, china, glass, and other similar substances, and not as to the means of producing patterns for any other purpose. And I declare that the size, proportions, materials, and other particulars of, and relating to, the machines, apparatus, and implements employed by me as aforesaid admit of various modifications, all capable of producing the same or the like effect, and may be varied at the discretion of the constructor or operator according to the nature of the work to be performed.—In witness whereof, &c.

Enrolled December 3, 1835.

Specification of the Patent granted to John Fussell, *of Nunney, in the County of Somerset, Edge-Tool Maker, for Improvements in Pumps.*—Sealed December 29, 1835.

WITH AN ENGRAVING.

To all to whom these presents shall come, &c. &c.,—*Now know ye,* that in compliance with the said proviso, I, the said John Fussell, do hereby declare the nature of my invention, and the manner in which the same is to be performed, are fully described and ascertained in and by

the following statement thereof, reference being had to the drawing hereunto annexed, and to the figures and letters marked thereon (that is to say):

Description of the Drawing.

a, a, is the ordinary pump-barrel. *b*, the valve at the bottom of such barrel. *c*, the suction-pipe; which parts may be made according to any of the various constructions now in use. *d*, is a vessel proceeding from, or opening into, the suction-pipe, just below the valve, *b*, and it is the application of this vessel, *d*, which constitutes the first part of my invention, and the improvements resulting from such application of the vessel, *d*, are as follows. It is well known, that in working pumps, particularly where the water has to rise or pass from a considerable distance, that the water does not follow to the action of the piston so quickly as to give full effect to the power employed in working the same. Now it will be found by applying my improvements to pumps the following effect will take place. On first working the pump, and consequently before any water rises in the suction-pipe, *c*, the first action of the piston will be to remove the larger portion of the air from the suction-pipe, *c*, and also fron the vessel, *d*, and the water will then rise and fill the suction-pipe and the barrel of the pump, *a, a*, and will for the most part fill the vessel, *d*, the consequence of which will be that, in the further working of the piston, immediately it commences to rise from the valve, *b*, the water in the vessel, *d*, will more readily pass into the pump-barrel than that the whole mass of the water in the suction-pipe, *c*, will be put in motion by the pressure of the atmosphere, but in the descending of the piston in the pump-barrel, the water rising up the suction-pipe will enter and again supply the vessel, *d*, and the water therein will then be ready for the next up-stroke of the piston. And it may be remarked that it is not necessary

that the vessel, *d*, should be at a distance from the suction-pipe, as it will be evident that the vessel, *d*, may surround the upper part of the suction-pipe.

Having thus described the nature of my invention, and the manner of performing the same, I would remark that I do not confine myself to the precise arrangement here shown, for the vessel, *d*, may be placed in some degree different, as above noticed, from that shewn, and yet obtain the object of my invention, that of having a vessel of water the more quickly to supply the working of the piston in the barrel, as above described.

The second part of my invention consists in so constructing the piston-rods of pumps that they constitute air vessels. *e*, is a piston-rod constructed according to my invention; it consists of a tube from the point, *e*, to the point, *f*, at which point, *f*, the piston-rod or tube is closed, and at the end, *e*, the piston-rod or tube is open, and the bucket or piston is attached at *e*. The consequence of this arrangement will be that the hollow piston-rod or tube will contain a quantity of air, which will, in the working of the pump, produce an uniformity of flow of water from such pump, in like manner to an ordinary air vessel which has been commonly applied to hydraulic machines.—In witness whereof, &c.

Enrolled June 29, 1836.

Specification of the Patent granted to John Lane Higgins, *of Oxford Street, in the County of Middlesex, Esquire, for certain Improvements in the Construction of, and in Working, Vessels for Navigation.* Sealed August 26, 1835.

WITH AN ENGRAVING.

To all to whom these presents shall come, &c. &c.—*Now know ye*, that in compliance with the said proviso,

I, the said John Lane Higgins, do hereby declare that the nature of the said invention, and in what manner the same is to be performed, are particularly described and ascertained in and by the following description thereof, reference being had to the drawing hereunto annexed, and to the figures and letters marked thereon (that is to say):

Description of the Drawing.

Fig. 1, is a longitudinal section of a vessel with two circular wheels, A, A, sliding up and down as occasion may require, in narrow trunks, B, *b*, *b*, *b*, *b*, in the middle line of the vessel; the wheels are to answer the purpose of sliding keels or lee-boards, keeping the vessel to windward when sailing in deep water, and to be raised up when running before the wind, or when navigating shallow rivers. The foremost wheel is suspended by chains or ropes passing over the pulleys, C, C, to which are attached balance-weights, D, D, one on each side or end of the trunk; the ends of the weights project beyond the end of the trunk, and on them a platform is placed, as shewn at D, D. When the vessel is "going about," or when it is necessary to "bear up" quickly, a man, by stepping on the platform, raises the wheel up the trunk, and thereby renders the vessel more obedient to the helm. E, at fig. 1, shews a sliding rudder passing up and down in a case or pair of cheeks, F; the sliding rudder is suspended by a chain or rope passing over a pulley so that it may be raised or lowered at pleasure.

Fig. 2, shews the keels and rudder raised up.

Fig. 3, is a transverse section shewing the keel when down. I do not claim the invention of sliding keels which have been used in various other ways, but my invention consists in the form and mode of working them. I propose to have the keels round, or of the form above shewn at fig. 4, so that if they strike the ground they may be driven up the trunk in safety; the sliding keels being made of iron or any other heavy material, they act as ballast; the balance-weights

may be applied in various ways, or the keels may be suspended by tackles, as shewn at *b, c, b, c,* at fig. 1. For vessels designed to be propelled by steam or manual labour, I propose to have a double vessel, or a run through the middle of a vessel to about the line of the draft of water, as shewn at figs. 5 and 6, with a trunk of about five or six feet in length (varying according to the size of the vessel), in which is suspended a double wheel, or pair of wheels, with one or more paddles revolving on the eccentric, A. The paddle-wheel may be turned by a crank or cog-wheels placed on the short spindles, B, B; the angle of the paddle may be varied, and the length and depth of the stroke may be regulated by the connecting-rods, C, C. When the vessel is sailing, the wheel to which the paddle is attached may be lowered so as to act as a sliding keel, to keep the vessel to windward, the paddle being stationary on the upper side of the wheel. The form of the vessel is not material, it may be varied according to circumstances, but I recommend fig. 5, as well adapted for general purposes.

Fig. 7, is a windlass for raising the masts of barges or other vessels which have to pass under bridges. When the mast is lowered down it requires a great power to raise it from that position, but as it rises, it requires progressively less power to raise it upright: this windlass acts with a very great power when the mast is lowered to its worst position, and it progressively quickens its speed, adapting itself to the power required, so that no time or labour is wasted, and the mast is got upright in less time than with the common windlasses in general use. A, B, C, at fig. 7, are three double wheels or pulleys, each pulley having a large and small barrel, as shewn at fig. 8. D, at fig. 7, shows the chain or stay, one end leading to the mast-head, the other end is hooked to the small barrel of A; another chain is hooked to the larger barrel of B, which is filled by passing the chain round it till it is full, and the other end of the chain is hooked to the small barrel at B,

another chain is hooked to the larger barrel of B, which is filled by the chain, and its end is hooked to the small barrel at C, which is put in motion by a winch or cog-wheels on the spindle at C.

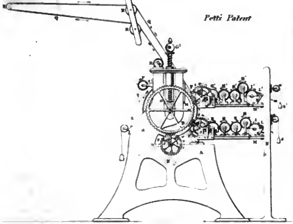
Fig. 8, shows the range of the pulleys, a large and small barrel being placed in a line with each other; the dotted lines at fig. 7, shew the position of the chains when the mast is down, the pulleys by means of the chains acting as wheels and pinions on each other: as the mast rises, the chains wind off the larger barrels and on to the smaller barrels, thereby diminishing the difference between the two diameters, and the mast rises quicker as its resistance becomes less, it is necessary to have a paul and break as in other windlasses for similar purposes; the number and size of the pulleys must be adapted to the size of the vessel.

Fig. 9, is a windlass for raising anchors with chain cables. A, B, C, are wheels with arms of cast or wrought-iron or some other strong material placed in a frame in a line with each other; the arms of the wheels have a notch at the end, as shown at fig. 10. The chain-cable is passed over and under each alternate wheel, and the wheels being turned by winches or cog-wheels placed on the spindles, the cable is drawn in without the necessity of surging; the angles formed by the cable over the forked arms of the wheels prevent it from slipping; the number of the wheels and of their arms, and the size of them, may be varied according to circumstances, but I think three or four arms to each wheel are the best numbers.

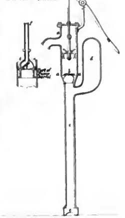
Fig. 11, is another arrangement of windlass for the same purpose as the foregoing. This windlass and that for raising the mast may be placed in one frame.—In witness whereof, &c.

Enrolled February 25, 1836.

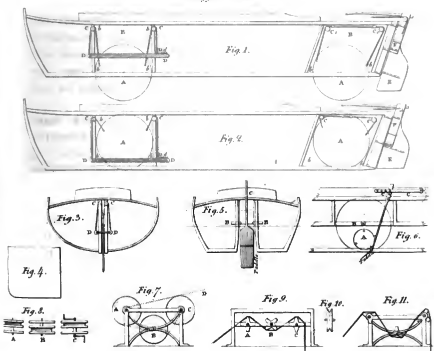
Petti Patent



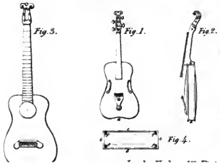
Fussell's Patent.



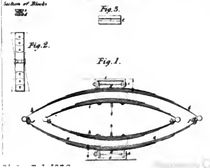
Higgin's Patent.



Howell's Patent.



Boulnois Patent.



Specification of the Patent granted to WILLIAM BOULNOIS, *the younger of Gower Street, in the County of Middlesex, Esquire, for an Improved Combination or Arrangement of Springs for Carriages.*—Sealed *January* 30, 1836.

WITH AN ENGRAVING.

To all to whom these presents shall come, &c. &c.—*Now know ye*, that in compliance with the said proviso, I, the said William Boulnois, do hereby declare the nature of my invention, and the manner in which the same is to be performed, are fully described and ascertained in and by the following description thereof, reference being had to the drawing hereunto annexed, and to the figures and letters marked thereon (that is to say):—

Description of the Drawing.

Fig. 1, shews four springs combined according to my invention.

Fig. 2, an end view of fig. 1, and,

Fig. 3, shews the plan of certain blocks hereafter described, by which the springs are attached to a carriage; *a*, *b*, are two ordinary bent springs which, if combined in the usual manner, would only have elastic play up and down, but by part of my improved combination these springs are also capable of lateral movement, which is accomplished in the following manner: *c*, *c*, are two blocks, one affixed to the proper part of the carriage, the other to the axle, and, *d*, *d*, are two blocks affixed to the springs, *a*, *b*, as is clearly shewn in the drawing; *e*, *e*, are two pins or axes which combine the blocks, *c*, and *d*, and allow of such blocks having a rocking motion, and thus permit of lateral movement to the springs, *a*, and *b*. This lateral action may also be obtained in other ways; thus, *f*, *f*, are small axes affixed to the outer end of the spring, *b*, *b*, and *g*, *g*, are straps or collars which receive

the axes, *f*, *f*, and those axes work within such straps or collars which form proper bearings for the axes, *f*, *f*, the straps or collars, *g*, *g*, being affixed to the spring, *a*, *a*, as is clearly shewn in the drawing; *h* and *i*, are a pair of springs combined in like manner to the springs, *a* and *b*, that is, having the capability of moving laterally, but these springs, *h* and *i*, have an elasticity in an opposite direction to the springs, *a* and *b*, as is indicated by the arrows, the black arrows indicating the direction of pull of the springs, *h*, *i*, and the red arrows indicate the direction of the elasticity of the springs, *a* and *b*. The object of thus loading the springs, *a* and *b*, by the elastic force of the springs, *h*, *i*, is to render the whole more easy when the carriage to which such improved combination of springs are applied, has a light load, and it should be stated that when the carriage has a heavy load then the springs, *h*, *i*, being pressed inwards to a position when they will no longer act as a load on the springs, *a* and *b*, but will assume the position from which they have been drawn in the first instance by affixing them to the springs, *a*, *b*, and thus the springs, *h*, *i*, become resisting springs to assist the springs, *a* and *b*, in sustaining the load in the carriage. Having thus explained the nature of my invention, I would remark that it will be evident that it is not essentially necessary that the whole combination of springs should be at all times used together as my invention may in some instances be usefully employed by separately employing the lateral motion above described, without the loading springs, *h*, *i*, and the loading springs, *h*, *i*, may be used as part of my improved combination distinct from the part of the combination by which springs like, *a*, *b*, obtain a lateral movement as well as their natural elastic movement up and down, but I prefer the combination to be used entire; and further, it is not necessary that the two springs, *a* and *b*, should be used when combined with the means of obtaining lateral motion, and the other object of my invention, but to

some carriages only one spring, *a* or *b*, may be used; and the springs, *a* and *b*, need not have the parts, *f*, *f*, and *g*, *g*, but only obtain their lateral movement by the blocks above described, while in others the parts, *f* and *g*, may be retained and the blocks dispensed with. And I would remark that I lay no claim to the parts separately they being well known. But what I claim as my invention of an improved combination of springs is the giving them a lateral motion according to principle herein described, and also the using of the loading spring, *h* and *i*, as above described.—In witness whereof, &c.

Enrolled July 30, 1836.

Specification of the Patent granted to Thomas Howell, *of Clare Street, Bristol, Music Seller, for certain Improvements in Musical Instruments.*—Sealed December 21, 1835.

WITH AN ENGRAVING.

To all to whom these presents shall come, &c. &c.—*Now know ye*, that in compliance with the said proviso, I, the said Thomas Howell, do hereby declare the nature of my invention, and the manner in which the same is to be performed, are fully described and ascertained in and by the following statement thereof, reference being had to the drawing hereunto annexed, and to the figures and letters marked thereon (that is to say):—

My invention relates, first to improvements in the construction of the violin, tenor, violoncello, and double bass.

Secondly, in improvements in the construction of the Spanish guitar.

Description of the Drawing.

Fig. 1, represents a plan of a violin constructed according to my improvements.

Fig. 2, is a side or edge view of fig. 1. In each of these figures the same letters indicate similar parts. It will be desirable in order clearly to point out the object of my invention, to state that according to the usual construction of the violin, tenor, violoncello, and double bass, the necks are of such a length, that by stopping the string on the finger-board at the point directly above the part of the neck which is glued to the body of the instrument, a major sixth to the open string is produced, the consequence of which construction is, that the player has considerable difficulty in reaching in order to stop the strings nearer to the bridge, and hence arises that inelegance of action which is so much complained of, even in the most expert performers.

Now the object of my invention is to reduce the length of the upper part of the body of the instrument, measuring from the bridge towards the neck, and proportionably increasing the length of the neck for facilitating the fingering or stopping of the strings of the instruments above mentioned, and also making the lower part of the body of the instrument longer than heretofore, with certain other modifications of the body of the instrument as will improve the sound, notwithstanding the shortening the length of the body in order to increase the length of the neck, which, according to the drawing, is shewn to be of such a length, that the performer stopping the string on the finger-board opposite or at the point above where the neck is glued to the instrument, would produce a major tenth to the open string. The manner of making the above mentioned instruments being well understood, it will not be necessary to enter into a particular description of the manner of putting the various parts together. I will therefore point out the further change in the construction of the instrument shewn in the drawing; *a, b,* is the hoop which combines the belly and back of the instrument together, but it will be seen that in place of the hoop, *a, b,* being of the same height from end to end,

as is the most usual construction of the hoops of such instruments, it inclines from the end, *a*, to the end, *b*, as is clearly shewn in the drawing, by which the hoop assumes the form of an inclined plane. From this particular formation great practical advantages result. The sound post can be raised to its place with facility, the instrument being thus allowed to be constructed to any required flatness, which I consider a great desideratum as flatness of the back and belly when applied with judgment, in my opinion, is conducive to a continued equable sound. In fig. 1, it will be seen that the end, *a*, of the violin in place of being curved outwards (where the chin of the performer rests, which is the usual form,) is curved inwards, by which the instrument may be held with greater ease, and the performer enabled to play with greater freedom, as he will by this construction be able to hold the instrument firmly under the chin, the concave at the end, *a*, of the instrument fitting the neck of the performer. It will be seen that in place of having the tail piece attached to the tail pin, as is usually the case in the violin, tenor, violoncello, and double bass, I cause the tail piece to be glued or affixed to the belly of the instrument as is clearly shewn in the drawing; by this means the tail piece is out of the way of the chin (when used to the violin or tenor), and by this arrangement it will be found that the instrument whether violin, tenor, violoncello, or double bass, will be kept better in tune. I have not thought it necessary to shew a drawing of a tenor, violoncello, or double bass, with my improvements applied thereto, but from the drawing of the violin, and the description thereof given, a workman will readily apply the improvements thereto, observing, however, that in constructing the violoncello and double bass, it is not necessary to form the end, *a*, concave or curved inwardly, but that end may be of the ordinary construction.

Having thus described the nature of my invention applicable to the violin, tenor, violoncello, and double bass,

I would remark that what I claim as my improvements consist in the shortening of the length of the upper part of the body of the instrument, and proportionably increasing the length of the neck, whereby the action of fingering is greatly facilitated. And I also claim the construction of the hoops, *a*, *b*, as above described. And I claim making the lower part of the body of the instrument longer than heretofore, measuring from the bridge; and I do also claim the curving the end, *a*, inwards, as above described. And I claim the fixing the tail-piece to the belly, as above described.

I will now proceed to explain my improvements in the Spanish guitar.

Fig. 3, shews a plan of a guitar, having my improvements applied to that instrument, which consists of the elongation of the neck similarly to the instruments already described, and as will be readily seen by an examination of the drawing. The object of such lengthening of the neck from that part thereof which is glued or affixed to the body of the instrument is to obtain greater facility to the player, and greater command over the strings.

The second improvement in this instrument consists in the constructing the end, *a*, of a concave form, as is shewn in the drawing, and similarly to the construction of the violin and tenor, which shape or form to the end of the Spanish guitar will be found to offer convenience of holding not found in guitars having the end convex as is usually the case.

The third improvement in the Spanish guitar consists in the improved method of lining.

Fig. 4, shews part of the section of a guitar. *e*, is the part of the belly. *d*, part of the back; and *e*, part of the hoop, by which the belly and back are combined. *f*, is the improved lining on which the belly and back are glued, the lining proceeding as usual round the body of the instrument. This lining is constructed by means of

a series of layers of veneer glued together in a frame of the figure or shape of the Spanish guitar; these linings thus formed and applied, add considerable strength and renders the instrument more durable; and by this arrangement I am enabled to use three bars only to secure the belly of the instrument, by which there will be obtained more vibration than on the old plan; I place a bar to rest on the blocks, at each end of the instrument, and the third bar near the sound-hole.

The fourth improvement in the Spanish guitar consists in applying a tail-piece, similar to those used in violins, that is, having holes and slits formed therein, in place of pegs, as heretofore practised, this improvement is clearly shewn in the drawing; but I would remark that I do not claim the affixing such tail-piece to the belly of Spanish guitars by glueing the same thereto, as the ordinary tail-piece or bridge of the Spanish guitar has heretofore been so affixed.

The fifth improvement consists in giving to the head of the Spanish guitar the lyre form, as shewn in the drawing, in place of the common head heretofore used, by which greater elegance of construction will be obtained. I would, in conclusion, remark, that although I have described the necks of the above-mentioned instruments (the violin, tenor, violoncello, double-bass, and spanish guitars) as being constructed of a particular length, I would have it understood that I do not confine myself thereto, as it will be evident that any increase of the length of the necks of such instruments, beyond what has been heretofore practised, and decreasing the length of the upper part of the bodies of those instruments will proportionably facilitate the act of fingering; I do therefore claim in respect to that part of my invention, the making the necks of the instruments herein specified, that is to say, the part beyond that which is joined or glued to the bodies thereof, of a greater length than when by stopping the string opposite, or at the point above where the neck is glued, it

would produce a higher sound than heretofore, comparing it with the open string.—In witness whereof, &c.

Enrolled June 21, 1836.

LAW REPORTS OF PATENT CASES.

In the Court of Common Pleas, before the Lord Chief Justice Tindal, and a Special Jury.

CORNISH and another *v.* KEENE and another.

[*Continued from page* 117.]

Sir Frederick Pollock.—May it please your Lordship, and gentlemen of the Jury, I have to address you on the part of the defendants in this case.

The plaintiff says, I am the inventor of improvements in making elastic web. I will prove to you, in point of fact, that the very article was made by the defendants long before the patent, and I will prove it was made by other manufacturers, certainly not less than three, or four, or five. I will prove its existence in various directions and quarters. I will prove that these articles, similar to No. 4, were made before the patent, and I shall close the matter of fact by submitting to his Lordship, with the greatest possible confidence, that this patent is not sustainable after the patent which the defendants themselves took out in 1831. The present patent is taken for three objects. Now, gentlemen, I am not going to do the ungracious and unpopular act of quarrelling with No. 3, because Nos. 1 and 2 cannot be sustained, yet there is not a tittle of evidence that Mr. Sievier ever sold a single article of *Object One*, or that it ever was made till within the last fortnight, and then it was made to prove, as a matter of form that it could be used. The second object of the invention has only been made within the last few months, and the only persons called to prove its utility are two tailors, who examined the cloth "*lately*,"—"yes, very lately indeed, 10 o'clock on Sunday night" before the trial was coming on, within 12 hours almost. Now, here again, gentle-

men of the jury, do not imagine I am about to attack the patent in the way in which Brunton's patent for chain cables was attacked; I act solely and exclusively for the purpose of giving character to the invention, and seeing what really is the conduct of the plaintiff, and how far Mr. Sievier fairly entitles himself to the character of a great public benefactor. I now come to No. 3; I call his Lordship's attention to what was stated by my friend Serjeant Wilde, and stated by more than one of the witnesses to the patent. The principle, the scope, the aim, of the patent, and that upon which it rested for its title to your verdict. My learned friend described it as being a mixture of the two articles, elastic and non-elastic, in the same plane, and my learned friend puts it, that the circumstance of this mixture being in the same plane, is the point upon which the plaintiffs mainly rest. Now, gentlemen, I will read to you the object, and I will then read to you the manner in which that object is performed; I will not take up your time with objects first and second.

"The third object is to produce cloth." I lay no stress on the word "cloth," because I understand, and I take it for granted it is so; "cloth" means anything that is woven, be it the narrowest tape with which my learned friend ties up his large bundles of briefs, or the wider cloth that is sold.—"The third object, is to produce cloth from cotton, flax, or other suitable material not capable of felting, in which shall be interwoven elastic cords or strands of India-rubber coated or wound round with a filamentous material."

That is all, gentlemen, "cloth from cotton, flax, or other suitable material not capable of felting, in which shall be interwoven elastic cords or strands of India-rubber, coated or wound round with a filamentous material." That is all the statement of the object: and according to that statement any piece of weaving (I beg to call his lordship's attention to this), any piece of weaving, or any sort of which the only two materials to be formed, shall

be of cotton or flax, or any other material, and elastic cords of India-rubber coated with filamentous materials would be within this patent, and literally the very article, No. 1. Here is No. 1, this is cloth, gentlemen, because, if not, in making No. 4, we did not make cloth, what is it made of, why it is made either of cotton or flax, and there are interwoven elastic cords or strands of India-rubber coated with filamentous materials.—Is there any thing said about being in the same plane? Not a syllable; that which my learned friend told you was the gist of the patent is not there at all. The object is to claim every fabric of every sort which can be called cloth, in which these strands of India-rubber coated can be introduced, and apparently in any way or any shape whatever, either longitudinally, or transversely, or both, or in any way provided the cloth is made from a substance that does not felt, and there is a single thread of India-rubber coated or wound with filamentous materials. This patent applies, my lord, if No. 1, had never been made before, No. 1, could not be made now, and it is not pretended this patent prevents from making No. 1. I do not know whether your lordship sees this point.

The Lord Chief Justice.—Yes, I see what you mean.

Sir F. Pollock.—I say, gentlemen, distinctly, and I defy any person acquainted with the law of patents not to go along with me in this, that if No. 1, had not been made before, No. 1, could not be made on account of Sievier's patent of 1833, for No. 1, precisely falls within the object; in this way it is "cloth (here is No. 1) from cotton, flax, or other suitable material, and not capable of felting, in which shall be woven elastic cords or strands of India-rubber coated or wound round with a filamentous material." There being nothing there about alternation—about being in the same plane or anything else. Gentlemen, I am now pointing out that, in the mode described, there is nothing about alternation or being in the same plane.

I have before me a previous patent taken by Mr. Sievier on the 1st of December, 1831, and the specification was enrolled some time in 1832.

Chief Justice Tindal.—Enrolled in June, 1832.

Sir F. Pollock.—Your lordship is right. If this does not satisfy you, gentlemen, under the plaintiff's own hand, that elastic strand of India-rubber covered with brading had become the common property of every manufacturer in this kingdom :—If I do not satisfy you of that I will give up my cause. In Mr. Sievier's patent of 1831, he says he has "invented or discovered certain improvements in making and manufacturing of elastic cables, ropes, whale fishing, and other lines, lathe and riggerbands."—Now if I show you that the lathe band which if made under this patent of 1831, most unquestionably embraces either the samples, No. 3, or sample, No. 4, the present plaintiff is undoubtedly out of court, and I think when the whole matter of this patent is before you—when the matter comes for your decision, my lord—

The Chief Justice.—If the article was made known to the public before, he is out of court.

Mr. Attorney General.—My friend is upon the validity of the patent of 1831.

The Chief Justice.—He says there is an article described in the patent of 1831, which is precisely the same as your No. 3, if he proves that, of course the second patent is invalid.

Sir F. Pollock.—I will read to you the specification of the patent of 1831. "This invention consists in the application or employment of filaments, threads, or strands of caoutchouc or India-rubber, to or for the making, manufacturing, or constructing of elastic cables and filaments of caoutchouc or India-rubber, being first platted over or covered with hemp, flax, silk, cotton, catgut, Indian grass, straps of leather or other fit and proper materials are applicable for various other useful pur-

poses."—This is his statement.—"As filaments of India-rubber covered with cotton, silk, and other materials are now commonly used in the manufacture of many articles where elasticity is required"—say you to Mr. Sievier, What have you under your hand said in 1831? That filaments or threads of India-rubber covered with cotton, silk, or other material, are commonly used in the manufacture of many articles where elasticity is required—In what pray?—Why I think I may take it when Mr. Sievier took out his patent for cables, &c. thus the whole wardrobe of a gentleman or lady was already exhausted, and Mr. Sievier probably knows that such was the case, as they had been enumerated with great care in Hancock's patent of 1820. Mr. Sievier finding that the world was in full possession of the use of this material for all purposes, but that it had never been applied to certain matters, he said, I will take a patent for a fishing line, a bag, a purse. I do not find that Hancock has said any thing about that in his patent, therefore I will take up that. What is there new? Why this, says Mr. Sievier; all the world before caoutchouc was introduced, used web made of strands or cords of cotton; when India-rubber was introduced they then used precisely the same sort of thing, but they were all elastic. And now I claim a right exclusively to make some of them elastic and some of them non-elastic. This, I say, he cannot do; a man cannot take to himself that which is the common stock, if I may so say, of all the trading and manufacturing community; a man has no right in this manner to seize that and take it to himself. He must invent something which is new, and it is not enough to say you never before mixed these together; I will shew we have, I will shew his former patent points to mixing them together. I will shew that it was done by every body. It is clear every one of these strands was not wanted for elasticity, and it was obvious an article cheaper might be made, and the spe-

cimen which I cut off yesterday was made long before Mr. Sievier's patent was even heard of, and it is the most unlikely thing in the world that it should not have been made. It is the most simple thing for any one to say, do we want the whole of these? cannot we make an article equally useful to the public and cheap? It was done, and I will produce to you a specimen before even Sievier's patent was taken out. What, after all, is the description of the patent of 1833? what is his object? The object is to produce "cloth from cotton, flax, or other suitable material not capable of felting, in which shall be interwoven elastic cords." Well, Mr. Sievier, and how do you do this? Why, if his lordship recollects the manner in which that is to be done, he will find it amounts to this, says Sievier, "I have taken out a patent for interweaving elastic strands covered with other material." Well, Mr. Sievier, and how do you do it? Why, sir, I do it;—well, but how do you do it? Why, sir, I do it, and that is the way. Gentlemen, I appeal to your good sense if you will take a copy of this specification, and ask yourselves whether this is not a fair, just, and perfectly correct statement of Mr. Sievier's specification. I call your attention to this—read what he intends to do, and then read the manner in which he professes to do it, and I appeal to his lordship whether I am not perfectly correct in stating that there is no process described, that there is no art, that there is nothing new stated, and when you come and ask Mr. Sievier, how to do it, he answers, literally, "I do it!" It is of importance I make this perfectly intelligible, and I beg, gentlemen, now that you are aware of the history of this, and you find so far back as 1831 he himself professes these covered strands of India-rubber are nothing but common property. But, gentleman, I have a most important body of evidence which I shall shortly open, because, of course, the effect of that testimony must depend on whether you believe the series of facts I shall lay before you: I will state a word or two on the facts as

I open them to you. Now, in the first place, there is a piece of web cloth or whatever I am to call it.

The Lord Chief Justice.—Call it, A, that is the one that Mr. Rogers, the plaintiff's witness, said was the same in principle with No. 3.

Sir F. Pollock.—Yes, my Lord.

The Lord Chief Justice.—If you prove that was made and publicly sold before the date of the patent, there is an end to the cause; their own witness says it to be on the same principle.

Sir F. Pollock.—It is composed partly of cords of cotton that are non-elastic, partly of cords of India-rubber which are elastic. Now it is not denied that before any body introduced a patent at all upon this subject, a web of this description made altogether of these cotton strands was manufactured. It is not denied that No. 1, was made with all the strands elastic, but, says my learned friend, you must make them all one way or all the other, all the materials are the common property of every weaver, but you shall not mix them. I will call before you the man who made this (that marked A), not our own man; I don't mean to say we made it, but I mean to say a workman made it in the year 1831, and here is all this quantity of it. Gentlemen, here is a piece corresponding with that which was handed in yesterday, marked, W A, and there was another marked, W, both came from Wood and Westhead's of Manchester, before the date of the patent; this piece W A, has been unravelled to enable the witness, Mr. Rogers, to see of what it was composed. Here are two more pieces which I shall prove were made at Wood and Westhead's, as far back as Christmas 1832; there was another piece which we cannot find, which also came from Wood and Westhead's; that piece was marked, W, it has been since lost. I will shew you some of the same sort; I will prove at least five or six instances of previous making; I will prove that Newman, Collins, Ducorron, Chaplin, and another person, all made an ar-

ticle in which there was intermixed either in a few threads or cords non-elastic; and, gentleman, the probability of proving this is so great, that even if I were not capable of proving it by positive testimony in these various directions, I think you would come to the conclusion that it certainly was so, that it must be so. The case on the part of the plaintiffs is this, Lindsey comes to swear that the defendants did not make any such article, and some other persons come to state that they don't think any body else did or else they should have seen it. I shall certainly contradict Lindsey. (The learned gentlemen then, by means of models, explained the nature of the machinery used, and the alterations made therein, when it was desired to weave intermixed strands of elastic and non-elastic threads, and states that he should prove a loom was so altered in the defendants' factory in 1832, for the purpose of weaving such web, and that the plaintiffs' patent was not sealed till January 1833.) The learned gentleman then went on to say, I can prove Messrs. Keene and Co. had actually made this machine, and worked at it, and that a variety of persons in all directions had done the same; I shall shew that the defendants so far back as 1832, had put themselves in a condition to do this work, and had actually done it; it matters not whether they had brought it to precisely the same degree of perfection or not.

The Lord Chief Justice.—Mr. Attorney General, how do you distinguish the present discovery from that stated in the specification of 1832? I take the present patent to be taken for a new invention of weaving together elastic filaments that have been covered or coated, and also strands of either cotton or other material. I find in his specification made public in June, 1832, that riggerband; now he describes one mode in which this is to be effected by the word "interwoven." Interweaving what? He has already described one of the materials the filament of India-rubber which are to be covered. Then

he says "these are to be *interwoven*." If you look at the different passages in which the word "interwoven" occurs you will find it applies to the same purpose, and what is this but interweaving.

Mr. Attorney General.—With submission, my Lord, I can, in a few words, point out a material distinction between the specification of the patent of 1831, and the specification of the patent of 1832, there are to be the elastic and non-elastic working separately and independently of each other, not merely that the elastic should be covered and that there should be a combination of elastic and non-elastic, so that the whole should form one mass, as if there was a rope or cable, a cylindrical rope or cable to be formed, that is the specification of 1832. In the specification has been described the elastic and non-elastic in the same plane, working independent of each other, so that they may be contracted the one independent of the other. In the specification of 1832, the combined materials are to be interwoven. Now, what is to be interwoven? Let me respectfully beg your Lordship's attention to that. Why, it is the filaments, threads, or strands of India-rubber that are to be interwoven. "The filaments or strands, after being covered with the different materials above described," are then to be *interwoven*. This your Lordship will see exactly describes No. 1, where there would be a number of parallel strands of India-rubber, each covered, but there are no non-elastic strands to be interposed between them. That is the distinction, my Lord; what are to be interwoven are not filaments of hemp or silk, but what are to be interwoven are the filaments of India-rubber so covered. If those are the words which raise the difficulty in your Lordship's mind, I trust it is removed.

The Chief Justice.—I will not stop the case here.

Sir F. Pollock.—Allow me to say one word. It says, "the filaments, threads, or strands, after being prepared by platting over, covering, or intermixing them with

any of the different materials, as above described, either singly or mixed are for the manufacture of any of the various articles above mentioned, to be platted, netted, knitted, layed, or interwoven, one with the other, by any kind of machinery." Now, my Lord, if your Lordship looks at the third object—

The Lord Chief Justice.—Yes, it comes very near, so near that you can hardly distinguish them.

Mr. Cresswell.—We put in Hancock's specification, filed on the 8th of August, 1820.

Isaac Newman sworn. Examined by *Mr. Creswell.*—I am a spring maker; have been in that trade twenty-six years. I know a person of the name of Godby; I have been employed by him as a spring and India-rubber web maker. I first turned my attention to India-rubber webbing in 1831. I made web of elastic and non-elastic combined, at the suggestion of Mr. Godby; I made one piece with a white middle and green edge thread, and thread that is elastic and non-elastic in May, 1832; the white was elastic, the green non-elastic. I made two or three pieces; I sold the majority to Mr. Godby. I made web of elastic and non-elastic in plain drab. Those pieces of combined web were both manufactured and sold by me in 1832 to Mr. Godby.

Cross-examined by *Mr. Attorney General.*—I have no specimen of any such web manufactured in 1832; I have not tried to get any. I continued to manufacture that description of web till the beginning of 1833. I found this manufacture quite the reverse of an improvement to what I had before done, and calculated to bring the thing into contempt, neither having the elasticity nor the firmness required,—that is my opinion; I therefore gave it up. I wove web for braces on the original principle, making them all elastic; I did that till within the last year and a half; I have since been engaged in the gut line, which is a staple commodity. I have been engaged in that twenty-eight years. It was Mr. Godby who suggested the thing

to me. Godby advised me to make the experiment, and I went on making experiments. The experiments did not answer, in my opinion, and I gave it up. I made numbers of articles and threw them away. I went on making experiments till I found this plan would not] answer, and I gave it up.

Re-examined by *Mr. Creswell.*—I made it for braces and garters.

The Lord Chief Justice.—He thought the one he made in 1832 was calculated to bring the old one into contempt. I suppose he meant the new one was not so good as the old, thus that the article he made would bring the thing into contempt.

Mr. Attorney General.—Would bring the India-rubber into contempt.

The re-examination continued by *Mr. Creswell.*—With all these samples before me, I still say the same, that they would be contemptible, they would condemn any braces, they have too much elasticity, no power.

John Cotterill sworn. Examined by *Sir. F. Pollock.*—I am a weaver; have been so twenty years. I first manufactured elastic web in 1831, for braces and garters. I made this elastic web in 1831, in November: it is of elastic and non-elastic mixed. The strands are all elastic except the white.

By *The Lord Chief Justice.*—How do you know it was in November, 1831.

Witness.—My two children died; I have the certificate in my pocket. It was then I commenced making the web.

Examination of the witness continued by *Sir. F. Pollock.*—I do not know of any other person having made such web; I did it myself. I have seen a great deal since, but none before. The article did not answer; I left off making; I offered it for sale repeatedly, I could not sell it; I therefore went back to my own business again: I made thirty yards altogether; I did not think it a new invention, it was a simple thing.

Cross-examined by *Mr. Serjeant Wilde.*—I worked for myself in 1831. I never sold any of this make; I have never sold it. I brought it here yesterday morning. Mr. Newman applied to me on Saturday. I never offered it to Messrs. Nicholl and Co., in 1831. I was ashamed to offer it to any one. I was six months working at this article, on and off. The thirty yards would only take a few hours making. When I found it did not answer I threw it by. I worked for myself five years. I had seven looms. I can tell the names of the workmen, but I do not know where to find them. I call myself a brace weaver.

Re-examined by *Sir F. Pollock.*—This is not so strong as No. 1, it would not last half so long; it is cheaper than No. 1.

Thomas Godby sworn. Examined by *Sir F. Pollock.*—I am a brace maker, I have been in the trade four or five years, the first specimen of elastic web brought to me was in 1830. I never saw a web which had elastic threads with cotton between them, till I had it made for me in 1832; a person of the name of Newman made it for me. It was some India-rubber threads, and some cotton left between them to make it come cheaper, I suggested the idea. Newman never made me any great quantity. I used it for braces; it was cheaper: some was more and some less elastic. I suppose that was because it was not well manufactured. They were paid for in April, 1832. I shewed the article to Mr. Cornish; I furnished him with a bit of it. Mr. Cornish had at that time a manufactory. He called at my shop; it was either at the end of 1832 he called on me, or the beginning of 1833. Mr. Cornish came into the shop and saw some of the article, and said, "This is a queer looking article, Mr. Godby." I said, it is a cheap article. I cannot say whether any person acquainted with this description of article could perceive, at a slight examination, that it was made partly of the one and partly of the other. I gave

him a piece. He said he thought he could make it better. I told him if he did make it, I should like to have the first offer. I saw it at Mr. Keene's before the plaintiffs' patent of 1833. I bought a quantity; it was in May 1833. The first I got from Mr. Punton was in April 1834. No. 4, is nothing near so good as No. 1.

Cross-examined by *Mr. Attorney General.*—I sell a good deal made on the principle of No. 4. I have no doubt it has very much supplanted No. 1. I have bought a good deal from Messrs. Cornish and Sievier; for some trades it answers better than No. 1; others will not have it. I can dispose of more of No. 4, than No. 1; it is 20 to 25 per cent cheaper. I bought goods of this description of Mr. Harborough. I asked Newman to make it with less India-rubber, it did not answer very well: he gave it up; I suppose it did not answer. I suggested that the strands should be braided.

Re-examined by *Sir F. Pollock.*—I made twenty purchases at least of Newman, and am certain it was in 1832. I consider that the reason of selling a larger quantity of No. 4, than No. 1, is solely its cheapness.

Daniel Collins sworn. Examined by *Mr. Creswell.*—I am a manufacturer of brace webbing, and was so in 1832, I have since given it up. I made the original India-rubber web all rubber; the threads of India-rubber were braided; I braided it myself. I afterwards made it with India-rubber interwoven with cotton; I mixed them, first some elastic, then eight or ten cotton, all combined together in the same plane. It was by mere accident that I did so in trying experiments. I did not succeed in making any fit for the market; I sold thirty yards, I did not sell it myself, I employed a person of the name of Chaplin to sell it for me; I received the money for it. That was the only lot I sold; it was not, in my opinion, so good as with all elastic, but cheaper. I afterwards continued to make all elastic, I made no more.

Cross-examined by *Mr. Attorney General.*—I only

made one experiment, and that did not succeed. I found it would not answer my purpose, and I gave it up. I abandoned it and went to the old method. I made this experiment in 1832, as near as I can guess it was in October. I can swear it was not in 1833. I sold it to William Chaplin. I have none of it to shew; the article at that time was thought nothing at all of. All India-rubber must be best for all purposes. I have been a braiding machine maker since I gave up making brace webbing. I am a master, not a journeyman. I cannot say what it was that brought it into my head; I am not a weaver. When the elastic thread broke, the machine would go on without the rubber; that was, when I was making braiding the thought came into my head; that is how I came to think of it through the elastic thread breaking; this was when the elastic thread breaks in braiding, and then made the experiment with the loom, and I found the experiment did not answer.

The Chief Justice.—This is not like an experiment in a man's study or closet, which, if it fails, there is an end of it; but this went into the world such as it was.

Re-examined by *Sir. F. Pollock.*—I made it. I am not a perfect weaver, yet still I can weave a little. The thread often breaks in braiding. I am quite sure it was in 1832.

William Chaplin sworn. Examined by *Sir F. Pollock.*—I have been a weaver for forty-two years. Collins gave me some web to sell on commission in 1832. I think it was in November; there were thirty yards. It was made with what we call the intermediate elastic and non-elastic threads. I am quite sure that it was so. I sold it to William Lennard, of Goswell Street Road, a brace maker. I sold it at just half the price of the general run of elastic web at that time. It did not answer nearly so well as the old stuff; I have made similar myself. It was before, I said that it was in 1832. I made mine in May; Collins gave me his in November. I have none left, I

sold it to William Lennard, a customer. It never was nor never will be so good an article for braces.

Cross-examined by *Mr. Attorney General.*—I did not want any one to put such a thing into my head, I invented it myself. It was in the month of May, 1832, on the 5th. It was as likely to be at night as the day; it might be in bed. I often think of these things lying in bed, as in the day. I really believe I was lying in bed at the time; I will not swear that I was, but I think so. I am a married man, and have thirteen children. When I got up I immediately set to work. The same loom will do for either mode of working equally well. When I got my warp in, I set to work the same day. I made fifty yards. I was two days making it. I did not like my work; it had not the substance of all elastic. I sold it to Lennard. I do not know where Lennard is, I wish I did, he owes me nearly nine pounds. I was first found out by Collins, on Saturday night last. I never made any more of this; I found it would not pay. I employed myself in weaving and selling by commission. I have sold web to Mr. Rogers, but never offered him any of the experimental web. I offered it to no one else than Lennard. In May and November I was supplying Rogers with the largest quantity of another article, but not India-rubber.

Re-examined by *Sir F. Pollock.*—The web I made was better than this. I sold fifty yards in May, and that of Collins in November.

Joseph Alexander Ducoron sworn. Examined by *Mr. Creswell.*—I have been for sometime a manufacturer of elastic web in this country. I commenced in 1829. The first elastic web was all rubber; the strands were braided before putting on the warp. I made web of strands of elastic, and some strands non-elastic. I began in 1829, and must have made a piece of that kind in 1830. I had a Frenchman of the name of Descombes in my service; he left me in 1832. He was employed in manufacturing web of this description, elastic and non-elastic. I have a daughter

that assists me; she was taught to weave by Descombes. I remember seeing that pattern in the loom (pointing to a red pattern). That was made by Descombes. I searched for a pattern, and found that the piece of elastic is placed by the side of that which is non-elastic, that is, the warp is composed of them, and the weft binds them together. It is not so good as all elastic. I made very little; it might be three or four yards as an experiment.

Cross-examined by *Mr. Serjeant Stephens.*—I made it entirely as an experiment, only three or four yards. I did not like the result of the experiment; I considered it an inferior article. The rubber was braided before put in. I found that specimen two or three days ago. I found this in a drawer with other patterns. I cannot say how it came there; the other part of the three or four yards must have been sold; I think so, I will not swear it.

Re-examined by *Sir. F. Pollock.*—I remember this was a piece I made.

[*To be completed in our next.*]

PROGRESS OF SCIENCE

APPLIED TO THE ARTS AND MANUFACTURES, TO COMMERCE, AND TO AGRICULTURE.

Analysis of two Ores of Platinum. By L. Svanberg.—(*Annalen der Physik, &c.*, 1835, *No.* 11, *from Berzelius's Johres-Bericht, No.* 15, *p.* 207).—Mr. L. Svanberg has analyzed two ores of American platinum; one which comes from Choco, and the other named *Platina del Pinto;* both of which have very probably been long received from America. The ferruginous particles were withdrawn by means of a magnet, and were not analyzed. The platinum del Pinto presented grains of several species, viz., first, round and rather brilliant grains of a colour verging upon the grey of lead, of the specific gravity $= 17 \cdot 88$, which were employed in the

analysis: second, angular grains of less brilliancy, of a light grey colour, of the specific gravity $=17\cdot08$: third, grains of a rough surface, of a colour slightly verging upon yellow, sometimes marked upon the surface with small black spots, and of the specific gravity $=14\cdot24$: and fourth, brilliant black grains of the specific gravity $=7\cdot99$.

The result of the analysis was:—

	Choco.	del Pinto.
Platinum	86·16	84·34
Iridium	1·09	2·58
Rhodium	2·16	3·13
Palladium	0·35	1·66
Osmium	0·97	0·19
Osmuret of Iridium	1·91	1·56
Iron	8·03	7·52
Copper	0·40	an indication
Manganese	0·10	0·31
	101·17	101·29

On the Nature of various Species of Mortar. By Professor Fuchs.—Fuchs has studied the nature of various species of mortar, and proved that their induration depends upon the formation of silicates of lime, and sometimes also of alumina of silicates. These silicates retain the water, and acquire the hardness of masses of stone, while the hydrate of lime in excess is gradually united with carbonic acid; so that the hardened mortar may be considered as a mixture of carbonate of lime and of zeolite. Opal, pummice stone, obsidian, and pitch stone simply pulverized, form a good cement with hydrate of lime, but quartz and sand only produce a hydrated silicate upon the surface of each grain, which connects the mass, it is true, but which does not as speedily become solid. The finer the powder to which the quartz has been reduced, the more solid the mass becomes. If one

fourth of lime be mixed with the quartz, and the whole be well calcined, so that the mass becomes a frith, if it be afterward pulverized and mixed with one fifth of lime, an hydraulic mortar is obtained, which attains sufficient hardness to admit of being polished. Felspar with lime hardens slowly, and only at the end of five months, but calcined with a only small quantity of lime it becomes much better. Water abstracts from this mortar six per cent. of potash. Common potters clay, which is worth absolutely nothing when not calcined, produces when calcined with lime, a cement which hardens perfectly well, provided it do not contain much iron. Fuchs having found that *steatite* which had been heated to a bright red heat, would not combine with lime, and thence concluding that magnesia has a very strong affinity for silicious acid, tried the employment of calcined *dolomite* for the cement, instead of common lime, and found that it greatly surpassed the latter, both for the preparation of common mortar, and for that of hydraulic mortar: he even obtained good mortar of the latter kind, with calcined *marl.*

A. T.

NOTICE OF EXPIRED PATENTS.

(*Continued from p.* 125.)

William Baylis, Jun., of Painswick, Gloucestershire, Clothier, for a machine for washing and cleaning clothes.—Sealed November 27, 1821.

Thomas Motley, of the Strand, Middlesex, Patent Letter Maker and Brass founder, for certain improvements in the construction of candlesticks or lamps, and in candles to be burnt therein.—Sealed November 27, 1821.

Robert Bill, of Newman Street, Mary-le-Bone, Middlesex, Esquire, for an improvement in the construction of certain descriptions of boats and barges.—Sealed December 5, 1821.

Charles Broderip, of London, Esquire, now residing in Glasgow, for various improvements in the construction of steam-engines.—Sealed December 5, 1821.

Henry Ricketts, of Phœnix Glass Works, Bristol, Somersetshire, Glass Mauufacturer, for an improvement in the art or method of making or manufacturing glass bottles, such as are used for wine, porter, beer, or cyder.—Sealed December 5, 1821.

William Warcup, of Dartford, Kent, Engineer, for certain improvements upon a machine for washing linen cloths, cotton cloths, or woollen cloths, whether in the shape of piece goods, or of any article made up of linen cloth, cotton cloth, or woollen cloth.—Sealed December 10, 1821.

William Horrocks, of Portwood-within-Binnington, in the county of Chester, Cotton manufacturer, for an improvement in the construction of looms for the weaving of cotton or linen cloth by power, commonly called power looms.—Sealed December 14, 1821.

James Winter, of Stoke-under-Hamdon, Somersetshire, Gentleman, for certain improvements in a machine for sewing and pointing leather gloves with neatness, much superior to that which is effected by manual labour.—Sealed December 19, 1821.

LIST OF NEW PATENTS.

Nathan Bailey, of Leicester, in the county of Leicester, Frame Smith, for certain improvements in, or additions to, machinery for manufacturing stocking-fabric. —Sealed August 1, 1836.—(*Six months.*)

John Thomas Betts, of Smithfield Bars, in the city of London, Rectifyer, for improvements in the process of preparing spirituous liquors in the making of brandy. Communicated by a foreigner residing abroad.—Sealed August 3, 1836.—(*Six months.*)

Webster Flockton, of the Spa Road, Bermondsey, in the county of Surrey, Turpentine and Tar Distiller, for certain improvements in preserving timber.—Sealed August 3, 1836.—(*Six months.*)

John Archibald, of the parish of Alva, in the county of Stirling, in the kingdom of Scotland, Manufacturer, for certain improvements in machinery or apparatus for carding wool, and doffing, straightening, piecing, roving, and drawing rolls or cardings of wool.—Sealed August 4, 1836. —(*Six months.*)

Ramsay Richard Reinagle, of Albany Street, Regent's Park, in the county of Middlesex, Esquire, for improvements in the construction of carriages for the conveyance of persons, and goods or merchandise.—Sealed August 6, 1836.—(*Six months.*)

Thomas Binns, of Mornington Place, in the Hampstead Road, in the county of Middlesex, Civil Engineer, for improvements in railways, and in the steam-engines to be used thereon, and for other purposes.—Sealed August 6, 1836.—(*Six months.*)

Thomas John Fuller, of the Commercial Road, Limehouse, in the county of Middlesex, Civil Engineer, for a new or improved screen for intercepting or stopping the radiant heat arising or proceeding from the boilers and cylinders of steam-engines.—Sealed August 9, 1836. —(*Six months.*)

John Burns Smith, of Salford, in the county of Lancaster, Spinner, and John Smith, of Halifax, in the county of York, Dyer, for a certain method or methods of tentering, stretching, or keeping out cloth to its width, made either of cotton, silk, wool, or any other fibrous substances, by machinery.—Sealed August 10, 1836.—(*Six months.*)

Henry Pershouse Parkes, of Dudley, in the county of Worcester, Iron Merchant, for improvements in flat pit-chains.—Sealed August 11, 1836.—(*Six months.*)

Joseph Douglass, of Morpeth, in the county of Northumberland, Rope Maker, for improvements in the manufacture of oakum.—Sealed August 11, 1836.—(*Two months.*)

Edward Light, of Royal Street, Lambeth, in the county of Surrey, Civil Engineer, for certain improvements in propelling vessels and other floating bodies.—Sealed August 11, 1836.—(*Six months.*)

William Newton, of 66, Chancery Lane, in the county of Middlesex, for improvements in the means of producing instantaneous ignition. Communicated by

a foreigner residing abroad.—Sealed August 11, 1836. —(*Six months.*)

Robert Allen Hurlock, of Whaddon, in the county of Cambridge, Clerk, for improvements in axle-trees.—Sealed August 11, 1836.—(*Two months.*)

Joshua Butters Bacon, of Regent's Square, in the county of Middlesex, Gentleman, for improvements in the structure and combination of certain apparatus employed in the generation and use of steam.—Sealed August 13, 1836.—(*Six months.*)

Thomas Gauntley, of the town and county of the town of Nottingham, Mechanic, for certain improvements in machinery for making lace, and other fabrics commonly called wash machinery.—Sealed August 15, 1836. —(*Six months.*)

George Leech, of 25, Norfolk Street, in the parish of Islington, in the county of Middlesex, Carpenter, for a certain improved method of connecting window sashes and shutters, such as are usually hung and balanced by lines and counterweights with the lines by which they are so hung.—Sealed August 15, 1836.—(*Six months.*)

William Fothergill Cooke, of Bellayse College, in the county of Durham, Esquire, for improvements in winding up springs to produce continuous motion, applicable to various purposes.—Sealed August 17, 1836.—(*Six months.*)

Joseph Hall, of Margaret Street, Cavendish Square, in the county of Middlesex, Plumber, for improvements in the manufacture of salt.—Sealed August 17, 1836.—(*Six months.*)

Francois de Tausch, of Percy Street, Bedford Square, in the county of Middlesex, Military Engineer to the King of Bavaria, for improvements in apparatus or machinery for propelling of vessels, for raising water, and for various other purposes.—Sealed August 25, 1836. —(*Six months.*)

Skinners' Patent

Fig. 1

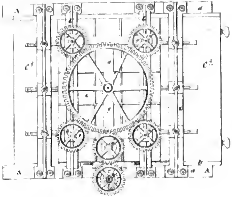
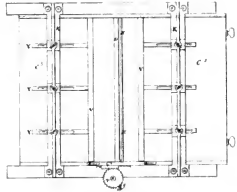
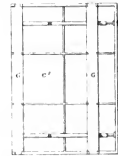


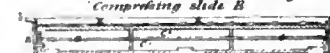
Fig. 2



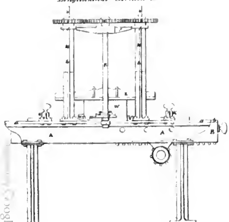
View of the underside of Plate C²



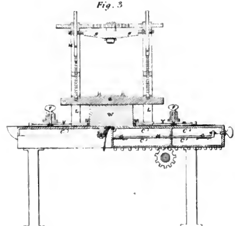
Section of the Plates C¹C² shewing Compressing slide B



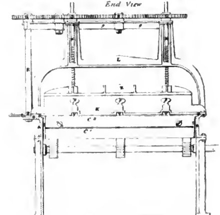
Longitudinal Elevation



Longitudinal Section.
Fig. 3



End View



THE

REPERTORY

OF

PATENT INVENTIONS.

No. XXXIV. NEW SERIES.—OCTOBER, 1836.

Specification of the Patent granted to JOSEPH SKINNER, *of Fen Court, in the City of London, Civil Engineer, for Improvements in Machinery for Cutting Wood for Veneers, and other Purposes.*—Sealed December 29, 1835.

WITH AN ENGRAVING.

To all to whom these presents shall come, &c. &c.,—*Now know ye*, that in compliance with the said proviso, I, the said Joseph Skinner, do hereby declare that the nature of my said invention, and in what manner the same is to be formed, are particularly described and ascertained in and by the following description thereof, reference being had to the drawing hereunto annexed, and to the figures and letters marked thereon, (that is to say):

Description of the Drawing.

The principal moving parts are supported between two parallel bearers or framings, A, A, fig. 1, with flanges, *a*, *a*, projecting from the upper edges at right angles outward. One of the bearers has a piece projecting from the upper flange at the riddle. The bearers are rabbetted out at their

upper angles. Each bearer supports a slide, B, B, fig. 1, with a flange, *b*, *b*, projecting from the upper edge outwards, occupying the rabbet. Between the slides are three plates, c^1, c^2, c^3, fig. 3. The first plate, c^1, has a right-angled projection surrounding the border, two crossing laterally equidistant between the ends, and one longitudinally through the middle. This plate is placed endwise between the slides with the face downwards, and on a level with the lower edges of the slides, and one edge on a line with their ends, the projections of the ends being fastened firmly to the slides with screw nuts. The second plate, c^2, in form and dimensions nearly resembles the first, and is placed directly upon it, with the face upwards, not fastened to the slides but moveable, by means that will hereafter be described. The third plate, c^3, has projections quite round the border and one laterally through the middle, all of the same width and thickness except that next the second plate, which, beginning at the face, has a general inward inclination of about forty-five degrees on an inward curved line. The third plate, c, has its ends secured firmly to the slides, the face being upward and on a level with their upper edges, and the outward edge on a line with their end. The cutting knife, D, D, figs. 2 and 3, is longitudinally straight, but transversely curved in a degree corresponding with the curved projection of the third plate against which it is placed, the upper part being on a level with the face of the plate, and the edge towards the second plate. The knife is secured firmly in its place by a gripe, *d*, fig. 3, which is of the same length as the knife, the projections of which form angles corresponding to the position of the knife, and the inside of the projection on the plate, and adapted to them respectively, one terminating in an edge, about an inch, more or less, below the edge of the knife, and the other in contact with the plate. The gripe is secured in its place and made to grasp the knife very firmly by means of screw-bolts, *e*, fig. 3, inserted through it between the angles at proper

intervals and screwed into the edge of projection which is on the plate, the projection varying in thickness according to convenience. The edge of the second plate near the knife is rabbetted out and in, the bottom of the rabbet pieces, with one end wedged shaped, are secured at proper intervals. A rod, E, figs. 2 and 3, which I call a compressing slide, the under edge being cut away at intervals, in a manner corresponding exactly to the wedged shaped pieces aforesaid, is placed in the rabbet; the slides are cut away opposite the ends of the compressing slide, permitting it to move endwise. Thus, by means of screws inserted through the parallel sides opposite the ends of the compressing slide, it may be moved, and its height, relatively to the face of the plate, varied at pleasure, or, instead of the said slide, a roller may be used. Between the first and second plates, and parallel with the knife, are two adjusting slides, G, G, fig. 3, each having two wedged shaped projections near the edges on the under sides. One of these slides is placed on the projections of the first plate, the outward edge on a line with the edges of the first and second plates next the knife. The other is placed at a proper distance from the opposite edges of the plates parallel with the first. Both are bedded just their thickness into the projections of the first plate, the beds being wider than the slides to admit of their sliding laterally. The adjusting slides are connected near their ends by connecting bars, H, H, fig. 3, inserted through the outward projection of the second plate a little above the ends of the connecting bars, H, H, and work in nuts which are attached to the upper side near their ends. By turning the thumb-screws different ways, the slides are made to advance and recede. Hence by their rising and falling on their inclined projections the second plate with the compressing slide may be adjusted relatively to the edge of the knife at pleasure. The bearers, A, A, are connected by ties, K, K, fig. 1, the ends of which are fastened to the upper flanges by screw-bolts, two transverse framings, L, L, fig. 1, are placed upon

the bearers at equal distances from their centres, they are furnished with feet which are fastened to the flanges of the bearers. From the feet they rise perpendicularly to a proper height, then curving inward they cross over the plates at a proper height, according to the proportions of the machine. Out of the horizontal part of the sections rise two perpendicular branches, M, M; each pair of which is surmounted by a horizontal cap, *f*, *f*, fig. 3. The first described part of the transverse bearings consists of a bar with an outward projection from the longitudinal centre increasing in width from the foot to the middle. The perpendicular branches are transversely of a similar construction, diminishing in size upward. A surmounting piece, *g*, fig. 2, is placed upon the horizontal caps, *f*, *f*, two parts of which extend laterally from one cap to another: and a centre piece commences at the centre of one of the lateral parts crosses the centre of the other and extends beyond it. The parts of the surmounting piece have a projection from the longitudinal centre of the under side. The ends of the lateral parts in size and form correspond with the horizontal caps, and are fastened to them by screw-bolts. A screw, N, figs. 1 and 2, with a square axis, is placed between each pair of the perpendicular branches, M, M, working in a box fixed at the lower end of the branches, the screw extending downward near the plate, and the axis extending upward through the horizontal cap. Centrally over each cap and resting in the surmounting piece, *f*, is placed a toothed wheel, O, fig. 1, which has a cylindrical nave projecting from the underside, the nave occupying a hole through the cap and surmounting piece. The axis of the screw passes up through the hollow of the nave and through an opening in the centre of the wheel. A toothed wheel, P, is placed centrally between the four wheels, O, O, O, O, gearing into them, its axis being inserted in the surmounting piece. Two wheels, Q, Q, fig. 1, are placed upon the projecting part of the surmounting piece, the first moveable on an axis, and

gearing into the large central wheel, P, and the other gearing into that and fixed on the upper end of a perpendicular shaft, R, fig. 1, which passes down through the surmounting piece, and has its lower end inserted into the piece that projects from the centre of the bearer. On the lower end of the perpendicular shaft, immediately above the bearer, is a reciprocating piece, S, fig. 1, moveable on the shaft, extending from the shaft inward, and is terminated by a toothed segment. Immediately above the reciprocating piece, S, a ratchet wheel, T, is made fast on the shaft; a rack, *r*, having a downward projection at either end, and also an inward projection, gears into the segment on the reciprocating piece, the downward projection occupying a slot on the flange of the bearer. On the outward end of the reciprocating piece a clutch is fixed for taking hold of the ratchet when moving in one direction. Parallel to each tie, K, K, inward, and just above the plates, is a moveable bar, V, fig. 2, the inward edge having a groove in, filled with firm wood, or other suitable material, for the edge of the knife to come in contact with as it finishes its stroke. Three lateral pieces, Y, Y, Y, figs. 1 and 2, having a groove in the under side, and a slot, *n*, in the centre, are connected with each bar at suitable intervals, and are notched into the under side of the ties. Thumb-screws, *p*, *p*, *p*, pass through the ties and slots, and screw into nuts occupying the grooves: thus the bars can be accommodated to blocks of different sizes, and fastened by thumb screws. A plate Z, figs. 1 and 2, with suitable projections on the upper side is suspended in the centre of the machine by being attached to the lower ends of the large screws. A piece or dog, X, fig. 1, with a slot in the centre, is fastened by a screw-bolt to the flange next the rack at suitable distances from either end. A block of wood, mahogany, or other timber, W, fig. 3, properly squared, is placed upon the centre of the machine; the bars, V, V, brought in contact with the

edges of the same; the suspended plate, z, brought down upon the top thereof all parts properly adjusted, a reciprocating motion given to the knife by crank power or any other mechanical means, the compressing slide, E, being little elevated above the face of the plate suitably near the edge of the knife, a thin piece is cut from the under surface of the block without being fractured, as the timber is prevented from parting in the grain before the knife, by the compressing slide. When the knife has completed its stroke within two or three inches, more or less, one of the dogs, X, comes in contact with the rack, the reciprocating piece is moved, but the clutch is so situated as to slide on the ratchet. But as the knife returns, the other dog brings back the rack, the clutch takes hold of the ratchet, all the wheels are moved, and the screws receive a turn sufficient to bring down the suspended plate firmly again on the block.

Having thus described the nature of my invention, and the manner of combining the various parts of the machine, in order to work the knife or cutting edge, D, by continually pressing the same forward till it has completed the cut of the veneer, or thin sheets of wood for the purposes, I would have it understood that I do not confine myself to the precise arrangement shewn and described, provided the essential properties of the machine are retained, that is to say, the blade or cutting edge, D, and the compressing rail or roller, *e*, as above described.—In witness whereof, &c.

Enrolled June 29, 1836.

Specification of the Patent granted to Joshua Proctor Westhead, *of Manchester, in the County of Lancaster, Small Ware Manufacturer, for an improved Method of cutting Caoutchouc or India Rubber, Leather, Hides, and similar Substances, so as to render them Applicable to various useful Purposes.*—Sealed February 16, 1836.

WITH AN ENGRAVING.

To all to whom these presents shall come, &c. &c.—*Now know ye*, that in compliance with the said proviso, I, the said Joshua Proctor Westhead, do hereby declare the nature of my said invention, and the manner in which the same may be performed and carried into effect, by reference being had to the annexed drawings, and the following description thereof. The scale to which the drawings are made is marked thereon, and similar figures and letters of reference are used to indicate similar parts throughout the whole of the drawings. The annexed drawing represents one arrangement of machinery or apparatus, by which my improved method of cutting is carried into effect.

Description of the Drawing.

Fig. 1, represents an end, and,

Fig. 2, a front view of a machine in which, A, is a driving shaft, which receives motion by hand from the crank handle, A, or from other power, as circumstances may require. This motion can either be imparted or arrested at the pleasure of the operative or person attending the machine. B, represents the fly wheel, for the purpose of equalizing the rotation of the shaft, A, and C, a pulley keyed on the shaft and carrying the strap, D. Immediately above the pulley, C, and parallel to the shaft, A, is placed the shaft, E, supported by two hangers, *d*, *d*, and revolving freely on its axis. On this shaft are placed the pulleys, *e* and e^1, the former receiving motion from

the strap, D, and the latter imparting motion to the strap, F, which passes round the pulley, f, placed firmly on the small shaft, f^1, f^1, carrying the two small circular discs or cutters, g, g, which are revolved (in the direction of the arrows) at an increased velocity due to the relative circumferences of the various pulleys, C, e, e^1, and f. By reference to the driving shaft, A, at the opposite extremity to that at which the power is imparted, it will be seen that a small bevel wheel, a, is placed thereon gearing into a similar level, a^1 or a^2, placed on a transverse shaft, b, b, as best seen at fig. 1. This shaft, b, b, is allowed to move endwise in the journals or supports in which it is supported, so that either the bevel, a^1 or a^2, can be put in gear with the driving bevel, a, and thereby the direction of rotation of the shaft, b, b, may be reversed at pleasure. When either of the bevels, a^1 or a^2, are put in gear with the bevel, a, it is kept so by means of a small catch, b^1, which falls into a groove cut into the shaft, b, b, and prevents any ends, traverse, or movement of the shaft until removed by the operator for the purpose of reversing the rotation. From the shaft, b, b, motion is conveyed by means of the pulley, G, and the strap, G^1, to the pulley, H, which is supported on a shaft by hangers, h, h, similar to the shaft, E, already described. This shaft is also provided with a small drum or barrel, I, as seen at fig. 2, which imparts motion at a reduced speed to the strap, i, and thence to the pulley, K, placed at one end of the shaft, m, m, m, as seen at fig. 2. At the opposite end of the shaft, m, m, (which is supported in the sliding carriage, n, n, n, n,) is placed a spur wheel gearing into a similar wheel placed on the extremity of a screw passing the whole length beneath the carriage, n, n, n, n, and taking into a stationary nut attached to the part, n^1, n^1, similar to the arrangement for traversing the slide rest in lathes for the ordinary construction, the direction of traverse or end motion of the carriage, n, n, n, n, necessarily depending on the di-

rection of rotation of the pulley, K. *o, o,* are two supports attached to the carriage, *n, n, n, n,* and provided with small shafts, *r* and r^1, which receive a slow revolving motion from the bevels, o^1 and o^2, the former of which is placed on the shafts, *m, m.* P, P, represent two stationary shields or rests supported from the part, n^1, n^1, each provided with an horizontal slot or opening to allow of the alternate traverse of the small shafts, *r* and r^1, as well as a perpendicular cut or opening through which the lower extremity of the cutter, *g,* is caused to revolve, as seen at fig. 2. By tracing the motion of this machine, it will be seen that the cutters, *g, g,* are receiving a quick rotation at the same time that the shafts, *r* and r^1, are receiving a slow rotation, as well as a slow end traverse or progressive motion, dependant on the screw motion which governs the traverse of the carriage, *n, n, n, n.* Supposing, therefore, a flat disc or piece of caoutchouc, leather, hide, or other similar substance, to be secured in the position represented at s, by means of washers and screw nuts, or other convenient apparatus, it will partake of the motion of the shaft, *r,* on which it is placed, and gradually revolve and keep in contact with the cutter, *g,* regularly approaching the same by the traverse of the carriage, *n, n, n, n,* in the direction of the arrow, n^6, and thereby cut the material, s, into fillet or tape, *t, t, t,* till the whole is disposed of. The utility of the rests or shields, *p, p,* will now be obvious in supporting the material to be cut when subjected to the action of the cutter, *g,* which has a constant tendency to press it against the surface of the rest, *p.* In operating with this machine it will be remarked that while the shaft, *r,* which carries the material, s, is approaching the cutter, *g,* the corresponding shaft, r^1, is receding from the cutter to which it belongs, so that when the piece, s, is finished, and the shaft, *r,* which supported it, is near to the cutter, *g,* the corresponding shaft, r^1, is at the greatest distance from its cutter. In this position the

machine is stopped by the operative or attendant, and the disc or flat piece of caoutchouc or other material placed on the shaft, r^1, the catch, b^1, elevated and the shaft, b, b, removed endwise in the direction of the arrow, b^6, fig. 1, so as to relieve the bevel, a^1, and bring the bevel, a^2, into gear with the driving bevel, a, and thereby reverse the direction of rotation of the pulley, K, and consequently the traverse of the carriage, n, n, n, n. The machine being again put in motion the cutting proceeds on the one shaft, r^1, while the opposite shaft, r, recedes from the cutter, g, preparatory to receiving a fresh piece of material as soon as that under operation shall be finished, and the machine again stopped as before; thus the shafts, r and r^1, are alternately loaded and the material cut from a flat disc into a continuous fillet or ribband. Now although the machine which I have above described, answers the intended purpose of enabling me to carry into effect my improved method of cutting caoutchouc or India-rubber, leather, hides, and similar substances so as to render them applicable to various useful purposes, I am fully aware that the same may be variously modified; as for instance, instead of imparting a rectilinear or progressive movement as well as a rotary motion to a piece of caoutchouc or India-rubber, leather, hide, or similar substance intended to be cut into fillets, a revolving motion only may be imparted, and by causing the pedestal or bearings upon which the revolving cutters work, to be fixed upon or attached to a sliding carriage, and made to advance in the direction of the material to be operated upon, a similar effect may be produced, and the caoutchouc, leather, hide, or other similar substance, be cut into fillets or tapes of the required thickness. It is also obvious that, instead of using revolving or circular cutters, longitudinal or straight knives or cutters may be applied, to which rapid reciprocating motion may be given for the pnrpose of cutting the caoutchouc, hides, and similar substances, into fillets. The position of the

various motions and parts of the machinery for the accomplishment of my method of cutting such materials, may also be considerably varied if required, and rendered more completely self acting or independent of the operative or attendant. But as one great advantage arising from the adoption of my improved method is that of cutting pieces of material of irregular shape and size, the adjustments of which must always depend on the judgment of the operative, I have considered it best to leave the machine also greatly dependant on his or her attention. I therefore wish it to be understood, that I claim as my invention not only the machine hereinbefore described, but also any modification of such machine by which my improved method of cutting caoutchouc or India-rubber, hides, and similar substances, into a band, tape, or fillet, by means of a revolving or other cutter acting on the exterior edge of such materials, and regularly cutting the same in a spiral or helical direction towards the centre can or may be effected. And such my invention being new, and never before effected by machinery, I do hereby declare this to be my true and faithful specification of the same.—In witness whereof, &c.

Enrolled August 16, 1836.

Specification of the Patent granted to Henry Martinson Robinson, *of the Minories, in the City of London, Paint and Varnish Manufacturer, for Improvements in certain Descriptions of Lamps.*— Sealed February 18, 1836.

WITH AN ENGRAVING.

To all to whom these presents shall come, &c. &c.— *Now know ye,* that in compliance with the said proviso, I, the said Henry Martinson Robinson, do hereby declare the nature of my invention, and the manner in which

the same is to be performed, are fully described and ascertained, in and by the following statement thereof, reference being had to the drawing hereunto annexed, and to the figures and letters marked thereon (that is to say):

My invention relates to those descriptions of lamps constructed and used for the purposes of illumination, and called essential oil, petroleum naphtha, or spirit lamps, in consequence of such lamps being adapted to consume such materials, and my improvements in such descriptions of lamps consist,

First, in the application of plates or surfaces of talc in place of metal or glass, as hereafter described.

Secondly, in constructing the wick holder of these descriptions of lamp of an open framing, whereby the material which is being burned may be more equally applied to the wick, and in making such wick holders of two parts, and applying a hinge at the lower end that it may be opened to receive the wick more freely.

Thirdly, in the application of a rack and pinion movement to the wick holders of these descriptions of lamps, whereby the wicks can be raised or lowered, and consequently adjusted with greater facility than the wicks of such descriptions when made according to the old construction.

And fourthly, the forming of the upper parts of the wick holder of a convex curved form, and also the giving a like figure to the talc or other surfaces placed on either side to confine the flame as hereafter described.

In order that my invention may be fully understood and readily carried into effect, I will now describe the drawing annexed, which represents a lamp suitable for burning essential oil, or naphtha or spirits, such as are usually burned in these descriptions of lamps.

Description of the Drawing.

Fig. 1, is a front view.

Fig. 2, an edge view of a lamp having my improvements applied thereto.

Fig. 3, is a plate of talc shewn separately, and,

Fig. 4, is a wick holder shewn separately with its rack and pinion movement. In each of these figures the same letters indicate similar parts wherever they occur; *a, a,* being the body of the lamp which may be made to the shape or figure desired; *b, b,* are two plates of talc placed in suitable grooves formed in the gallery or upper part of the lamp which receives the glass or chimney, as shewn by dotted lines. It will be found that by the application of surfaces or plates of talc in place of metal or glass, there will be these advantages, that the transferring of the talc will allow of the passage of the rays of light from the flame, whilst, at the same time, it will not, like glass, be prejudicially acted on by the heat. These plates or surfaces of talc are formed of a convex curved surface at the upper edge, in order to adapt it to the figure of the wick holder, but it will be evident that it may be made straight in like manner to the metal or glass plates formerly employed to confine the flame. *c, c,* is the wick holder, which will be seen to be composed of two plates or open surfaces hinged together at their lower end, *d, d,* by which means the same may be opened or closed with facility, and without being so liable to injury as when formed of a plate of metal bent or folded, and only capable of being opened by the elasticity of the material. The holder shewn in the drawing consists of a series of narrow plates joined together at top and bottom with other plates, the upper part is formed of a convex curved surface, in order to obtain a greater length of flame than the width of the lamp would produce were the same in a straight line.

I would remark that although I have shewn the holder as consisting of a series of narrow openings proceeding from top to bottom, it will be evident as the object is to obtain a better and more uniform supply of the material

which is being burned to the wick, the openings for that purpose may be made in any other direction. *e*, is a rack affixed to one side of the wick holder; this rack works in a square tube affixed in the upper part of the lamp, there being suitable bearings for the axis of the pinion and an enlargement of the tube to receive the pinion itself, as is clearly shewn by dotted lines in fig. 1. By the application of such rack and pinion movement to the wick holders of these descriptions of lamps, great facility will be obtained in raising and lowering the wicks in order to adjust the flame.

Having thus described my invention, and the manner of carrying the same into effect, I would have it understood that what I claim as my improvements, are,

First, the application of plates or surfaces of talc as above described.

Secondly, the construction the wick holders of such descriptions of lamps of an open or perforated frame work in place of unperforated plates, whereby the material (being burned) will be more readily permitted to pass, and be more equally supplied to the wicks, and also in forming the wick holders of two parts hinged together at bottom as above described.

Thirdly, the application of the rack and pinion movement to the wick holders of these descriptions of lamps, but I do not claim the raising of the wicks of lamps generally by such movement.

And Fourthly, I claim the forming of the upper parts of the wick holders of a convex curved form, and also the forming of the talc or other surfaces placed on either side to confine the flame to the same shape or figures as above described.—In witness whereof, &c.

Enrolled August 18, 1836.

Specification of the Patent granted to Julius Jeffreys, *of Osnaburgh Street, Regent's Park, in the County of Middlesex, Esquire, for Improvements in curing or relieving Disorders of the Lungs.*—Sealed January 23, 1836.

WITH AN ENGRAVING.

To all to whom these presents shall come, &c. &c.—*Now know ye*, that in compliance with the said proviso, I, the said Julius Jeffreys, do hereby declare that the nature of my said invention, and the manner in which the same is to be performed, are fully described and ascertained in and by the following description thereof, reference being had to the drawings hereunto annexed, and to the figures and letters marked thereon, (that is to say):

My invention consists in the employment of apparatus to abstract the heat from the breath during the act of expiration (which it receives from the lungs and from the air passages), and give off or transfer such heat to the incoming air, which is drawn in during the act of inspiration, and thus to warm the air and render it unirritating to the brouchial and other pulmonary surfaces, by which means the person using such apparatus, will constantly breathe warm air. To attain this object, it is well known that invalids are sent to temperate parts of our island, and to warm climates.

Description of the Drawing.

In figs. 1 to 5, the letters in each correspond with the parts they denote.

Fig. 1, is a front view of the case open, the side applied over the mouth being the back A, B, C, D, are a vertical line; H, G, I, a horizontal one; L, L, the lid open.

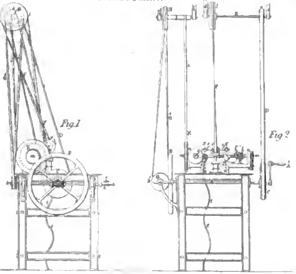
Fig. 5, is a side view of the case turned up, *i. e.*, the upper or lower side of the case when applied to the face.

Fig. 4, is the back or side next the mouth. These

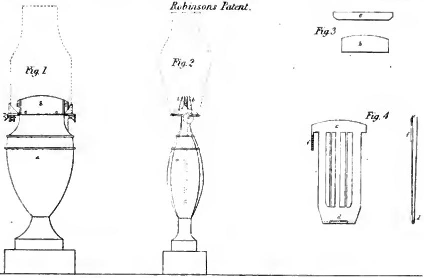
three views are of the case mounted with its pads, springs, ribbon, &c. L, L, a simple oblong and arched frame of wire, in fig. 5, is fitted to the front edge of the case when closed, one end of which at L, below, is turned into a hinge to carry it. The other end closes over a hasp, *h*. This wire carries a plate of silver finely perforated, so as to have about 1300 holes in the square inch, and about the two hundredth part of an inch thick, and large enough to cover the front of the case; it is stitched to the wire, and seen at P, P, fig. 1. It is coloured to match a ribbon (not shewn in the drawing), but which proceeds from each end of the plate, of the same width above, but wider below, to hide the chin, and passing towards the back of the head on each side of the face. Near the ears this ribbon meets a strap which is attached on each side of the case to a splinter bar, M, M, figs. 1, 3, and 5, fixed to the front of two wings projected from the ends of the case, and seen at H, G, figs 1, and 3, and 5. The whole of the instrument is thus screened from view, while the breath and air have free egress and ingress through the large perforated plate, which has more than 5000 apertures. The interior of the case is an oblong arch or a segment nearly of a hollow cylinder, but the front or convex, and back or concave arch, are not concentric. The side being one twelfth of an inch deeper at the middle, N, N, fig. 5, than at the ends. The instrument is of different sizes. The case of the medium size is nearly two and a half inches long inside between the ends, G, G, one and three-eighths inches wide, and about one-third of an inch deep (*i. e.*, from front to back) in the middle, and a fraction less at the ends.

Figs. 2 and 3, represent the naked metal case without the mountings and attachments; fig. 2, is a section across the middle, and fig. 3, a perspective elevation of the whole. B, F, G, I, in all the figures, shews the mouth hole in the back of the instruments, the edges of which are turned into a little gutter, one-thirty-second of an

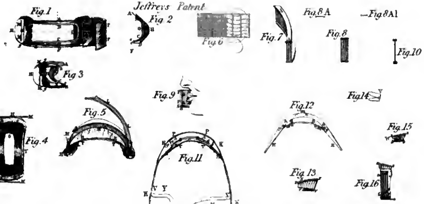
Westheads Patent.



Robinsons Patent.



Jeffreys Patent.



London. Hodson, 112 Fleet Street, October 1 1836

F. Mansell sc.

inch deep and wide, seen at B, C, fig. 2, carried all round the hole. This carries the moisture which is gradually condensed from the breath, and conducts it to the lower side of the case, D, along which lies a sponge, seen at S, in the section (fig. 9) of the instrument, and occupying the space, S, S, fig. 1, to the depth of one-tenth of an inch towards the mouth hole, but covering the whole of that side to within one-eighth of an inch at each end where the case is made narrower by smaller shoulders which support the packet of skeins to be described presently. The sponge place or chamber has a strip of metal in front of it united to the lower end side of the case, and seen at *e*, in figs. 2 and 3. The sponge lying in this chamber absorbs all the humidity as it gravitates to the bottom of the case. On the exterior of the case there will be observed at each end two wings, H, G, figs. 1, 2, 3, 4, and 5, about one inch long as wide as the case, and of the same curvature, and rounded at the extremities; they are, in fact, a prolongation of the back plate in which is the mouth hole. As the metal is very thin (about one-hundredth of an inch thick) they are stiffened and supported by a prolongation of the sides of the case seen at G, G, in figs. 1, 3, and 5, which are gradually decreased and are merely a narrow edge opposite H. The front of these wings give an attachment to the shanks of the splinter bars, to which the supporting straps are fixed: but the chief use of these wings is at their back or facial surface, where they carry two soft pads or cushions, *o*, *o*, *o*, fig. 4, of different materials according to the taste of the wearers, as leather, velvet, silk, or fur. These pads rest against the cheeks at the sides of the mouth which support whatever pressure the instrument is kept on with, and thereby relieve the lips from it so as to allow them to move freely. These pads keep the case a little, about one eighth of an inch, off the mouth in the middle, so that air would pass in and out by the false passage thus left between the case and the lips, were it not for the provision, R, R, T, T, figs. 4 and 5, T, T,

being a gentle spiral or gimp spring attached to the pads at each end, and enclosed and drawn in an arch by a little curtain of fine air-tight silk stitched to a leathern mounting which covers the whole exterior of the case. These slight springs apply themselves closely to the lips in all their movements preventing any false passage, but with a pressure so gentle as to be in no degree unpleasant; this part of the case is magnified, or shewn on an enlarged scale, to shew the curtains, &c., distinctly.

Fig. 11, represents the exact dimensions of the medium size respirator. The instrument is detained in its position by straps attached to the splinter bars, M, M, figs. 1, 3, 4, and 5, and by this arrangement it is allowed to revolve about the hook in the middle of the bar, and thus to adapt itself with equal pressure to every face, whether the chin be a projecting or receding one. In front of the ears a narrow ribbon is hooked to the upper edge of the strap and meets that of the opposite side at the top of the head, or is attached to the inside of the hat or bonnet of the wearer. The strap itself passes round to the back of the head where it is hooked to the opposite one; the use of the ribbon just mentioned is to keep the strap and instrument from working downwards. The front broad ribbon stitched to the front perforated plate is merely ornamental, hiding from view the angles at the ends of the case, and the splinter bar attachments; this ribbon is united with the straps behind the ears where it is terminated. Such is the case which holds the oral respirator, the operative parts of the instrument are shewn in figs. 6 to 10, consisting of a packet of from four to eight skeins of metallic thread, gold, silver, or platinum, being the best material, though I do not confine myself thereto, which is carefully laid over plates of silver, or other metal about one hundred and fortieth of an inch thick, and in the medium sized instrument three inches long and one fourth of an inch wide, with oblong perforations nearly half an inch long, and one-tenth of an inch wide over the

whole surface. The intermediate upright bars being one-thirtieth, and the horizontal one-fortieth of an inch wide. The perforations might be much larger; the horizontal bars might, indeed, be removed, but the action of the instrument as well as its durability would be thereby impaired, for these bars serve as a storehouse of the heat brought to them by the metallic threads. The metallic threads are laid on the plates nearest to the mouth at one-three-hundredth of an inch apart, on the next at one-six-hundredth, and on the front or outermost plate of the packet at only one-nine-hundredth of an inch apart. Notwithstanding this extreme closeness nearly one-half of the whole surface is to be unoccupied by metal forming an abundant passage for the breath.

Fig. 6, represents one of the plates partially covered with the metallic thread to shew the frame within.

Fig. 10, is an edge view of one of these skeins mounted above and below with a non-conducting edging of waterproof card.

Fig. 8, is an edge view of five of these in a packet kept the due distance apart by this card, and held together in the proper arch by an upper and lower plate of thin silver or other metal, which, however, should be such as not to be prejudicially acted on by the breath seen at fig. 8, A, A, and fig. 7, A, A. These plates of silver above and below make all the skeins into one firm packet. The curvature of the packet corresponds with that of the front of the case, but it is more curved than the back or mouth side of the case, the form of which approaches to a hyperbolic curve. The difference in these two curvatures causes a space to be left between the packet, and the case in front of the mouth hole, as seen at B, B, fig. 11, and B, fig. 9. This small space is one-twelfth of an inch wide, and is sufficient for allowing the breath to expand itself to all parts of the back skein of the packet after passing through the mouth hole.

Fig. 9, is a section across the middle of the instrument

when applied to the face. A, A, are the packet of skeins. B, the small back chamber or space. G, G, the gutter round the mouth hole. P, P, the front perforated screen plate. S, the sponge below for absorbing the condensed moisture. R, R, the springs inclosed in the air-tight silk, and lying against the lips.

Fig. 11, is a horizontal section of the whole instrument, and of the exact dimension of that of the medium size. P, P, is the front screening plate. A, A, the packet of skeins. B, B, the space between them. G, G, the gutter all round the mouth hole. R, R, the partition of air-tight silk, which, in fig. 5, is shewn greatly enlarged. T, T, one of the springs. *o*, *o*, *o*, *o*, the pads at each end, fixed on H, H, the wings. *g*, *g*, the prolongation of the sides of the case, serving as buttresses to the wings. K, K, the broad front ribbon which meets V, V, the straps behind the wings. Y, Y, the small bands which are tied over the head; thus no part of the oral respirator projects even half an inch from the face.

The above is a description of the instrument which is adapted to the mouth alone, and which may be named the "Oral Respirator," but it is requisite to provide an instrument which shall communicate with the nostrils as well as the mouth, to be worn by persons who have not accustomed themselves, by the use of the former, to breathe through the mouth alone. The "Oral and Nasal" (which might be compounded into a single word "Orinasal") "Respirator" differs from the other in the curvature of the packet of skeins, being much greater, which occasion a narrowing of the space, as seen at *a*, *a*, fig. 12, when compared with *a*, *a*, fig. 11, while the height of the arch is much increased making the chamber behind the packet five-sixteenths of an inch deep above, that is, immediately below the nose. And here is an opening in the upper side of the case founded by the dotted arc, *m*, *m*, *m*, or *n*, *n*, *n*, fig. 12, and equal to the whole depth of the chamber, as seen at *q*, fig. 12. The

edge of metal round this hole, excepting that next the upper lip, is turned over into a groove to receive the bent lower wire of the shield, z, z, fig. 12, and shewn detached at *b*, *b*, figs. 13, 14, and 15, v, being the naked wire, and w, and x, the wire covered with air-tight silk. The silk is on the outside of the wire so that the wire at v, v, figs. 13 and 15, may slide into the groove round the hole in the upper side of the case. This shield is made of various sizes to suit the noses of different persons, and has a narrow soft silk edging at top, *t*, which serves to close any little fissure arising from irregularity of the feature seen at z, z, figs. 13, 15, and 16. The air is thus enabled to pass freely from the nostrils behind the packets of skeins, and consequently issues in and out through them (all other access being closed) with the same facility as that from the mouth, with the difference only, that whilst most of the breath from the mouth has a horizontal course, that from the nostrils passes through the skeins obliquely downwards and outwards, as shewn by the diverging arrows, *t*, *t*, *t*, *t*, fig. 16. At bottom the back chamber is much narrower than above, as seen at Y, fig. 16, so as to admit of the elastic spring with the silk partition being used, which, as before described, applies itself gently to the lower lip. Above this provision is wanting, as there is not space for it on account of the free opening towards the nostrils. Here, therefore, the upper lip rests against the back of the case, mounted with any soft substance. Now it is of importance to observe, that while various substances may serve to conduct some of the heat from the breath, none will do it so effectually as a metallic one; and again, while many forms may be given to an instrument for this purpose, none other, I believe, will be found equal in its effect to that I have described, especially with reference to the division of the conducting substance into separate portions, as in the distinct skeins in the packet, and the keeping of them apart by an imperfectly conducting substance, as the card which separates the several

packets. By this separation of the skeins, they are maintained at different temperatures, that of the outermost being the lowest, and are thereby enabled to take up much more of the heat of the breath than if they were all of one temperature, which would be their state were they placed in contact with each other. This arrangement likewise qualifies them for supplying heat most advantageously to the incoming air, which, when cold, can take warmth even from the outermost skeins, and which, as it grows warmer in its progress inward, does still find every skein it arrives at warmer than itself, and therefore qualified to give heat to it. This particular arrangement, whether a metallic conductor be employed, or not, I claim as original. I also claim the employment of skeins such as I have described, of fine threads or wires of any substance, laid over a frame of any firm material whatever; also the use of a case of any firm material for carrying the operative part of such instrument, and receiving the condension from the breath, as well as the use of a sponge for absorbing this condensed moisture. So likewise do I claim the other parts of the instruments, as the lip-springs, the attachment bars, &c. I would further observe, that I consider the use of separate layers of any perforated substance, whether of metal or not, with or without the addition of fine thread or tissue to fall within the scope of my invention, for finely perforated plates of any firm substance, would, to a certain extent, execute the object of the invention, which, as first stated, consists in applying apparatus to collect the heat from the outgoing air, and give off such heat to the incoming air, and thus enable the wearer to breathe warm air, such variations in the apparatus, though in a degree very inferior to that attained to by the use of metal extended into the finest thread, and placed on distinct laminæ of metal plates perforated as above described. And, lastly, I claim the right to the use of metal as a conducting substance for the the above described purpose, of what kind soever, and in

what form soever, the metal may be employed.—In witness whereof, &c.

Enrolled July 22, 1836.

Specification of the Patent granted to ROWLAND HILL, *of Tottenham, in the County of Middlesex, Gentleman, for certain Improvements in certain Methods of Letter-Press Printing by Machinery.*—Sealed Febreary 12, 1835.

[*Concluded from p.* 151.]

Thirdly, respecting that part of my improvements whereby the paper of a scroll, consisting of a long continuous piece of paper, may be fed or supplied to letter-press printing machinery, which operates by cylinders revolving continuously, so as to print a succession of impressions on the paper of such scroll. Scrolls consisting of pieces of paper of any required length can be produced by paper-making machinery, having drying machinery annexed to it; and in order to damp such paper suitably for printing, the apparatus represented in sheet V. may be used. The scroll of dry paper, 50, is placed upon an axis, which is lodged in bearings across a frame, which has also a water-trough, 51, fixed across it with a roller, 52, revolving easily on pivots at each end, the lower part of its cirumference being immersed in the water contained in the trough, 51; and there is another roller, 53, which is covered with flannel, and which rests by its weight upon the roller, 52. Before using the machine, this flannel should be wetted by turning the rollers, 52 and 53, two or three times round it, will afterwards absorb moisture at its ends. The paper from the scroll, 50, is conducted down between the rollers, 52 and 53, and then up again, and is wrapped round an axis, 54, which should be of small diameter; which axis is also mounted in bearings across the frame, and is put in motion by an endless band, which encompasses a small pulley, 55, fixed on the extreme end of the axis, 54, and also a large pulley-wheel, 56, which is mounted on a stud-pin fixed in the frame, and having a handle to turn it round by. Note, the axis here spoken of must be placed in strict parallelism one with another. When the handle is turned round, its wheel, 56, and endless band and pulley, 55, communicate a rapid motion to the axis, 54, so as to wind off the paper from the scroll, 50, and gather it into a new scroll, 54*a*, and in its passage from one of those scrolls to the other, the paper is drawn between the two rollers, 52 and 53, whereof the lower one, 52, by re-

volving in the water contained in the trough, 51, brings up so much water continually as is requisite for damping the paper, applying the same with regularity and uniformity to the surface of the paper, which as it is gathered up in the new scroll, 54*a*, becomes damped, and after remaining a short time to imbibe the water which has thus been applied to its surface, the scroll, 54*a*, will be ready for printing. The degree of dampness which will be given to the paper by this method, can be regulated at pleasure by the depth of immersion of the roller, 52, into the water contained in the trough, 51, and the rapidity with which the paper is caused to pass through between the damping rollers. I have found the use of hot water instead of cold water to facilitate the operation of damping. A scroll of paper, 54*a*, thus prepared, is applied in front of the machinery, as is shewn in sheet IV., with its axis parallel to the type-cylinder and platten-cylinder, the axis being supported in suitable bearings, 57; and for first introducing the paper, one end of the scroll is attached in a temporary manner to the platten-cylinder, by folding the extreme end of the paper into that notch in the platten-cylinder, R, which serves to fasten the blanket around it, and sticking the paper on a row of sharp pins which project withinside of the notch, which must be at that time turned towards the type-cylinder. And note, the machinery is supposed to stand properly prepared for printing, with the types properly inked, either from having been recently stopped in the midst of its operation of printing, or else prepared by turning the type-cylinder round, whilst the inking apparatus is in action, but the platten-cylinder being at that time separated from the type-cylinder by turning aside the two eccentrics, S, S, by their common cross link, T. The end of the paper being thus attached to the platten-cylinder, R, the machinery is turned a little way in order to carry the end of the paper in between the platten-cylinder and the type-cylinder, then by turning the eccentrics, S, S, by their cross link, T, the platten-cylinder is restored to its proper situation for printing; the machinery is again put in motion and begins to print on the paper, and when the end thereof has been carried by the motion of the platten-cylinder to a sufficient distance round its surface, the machine is stopped, and the said end of the paper is then detached from the notch in the platten-cylinder, and that end is attached to another axis, 60, like that of the scroll, 54*a*, in order that the paper may be wound up around the axis, 60, as fast as it is printed, and comes through from between the type-cylinder and the platten-cylinder The attachment of the ends of the paper to the axis upon which it is wound may be made by a little stiff paste, by points projecting from the axis, or by being wedged into a longitudinal groove in the axis, or by any other suitable means. The axis, 60, is turned round in a suitable manner for thus winding up the printed paper by means of a

circular wheel without teeth fixed on each end of it, to rest upon the circumference of corresponding wheels which are fixed one on each end of a horizontal axis, 61, situated] in front of the machine in suitable bearings parallel to the axis of the type-cylinder, and turned round therefrom by an endless band encompassing a pulley upon one end of the axis, and also a corresponding pulley on one end of the axis of the type-cylinder. The axis, 60, by its own weight and that of its two wheels and of the paper around it, presses those two wheels upon the other two wheels before-mentioned, at the ends of the axis, 61; and the axis, 60, is turned round by their contact, which is sufficient for winding up the paper, although those wheels slip as the scroll of printed paper which is wound up around the axis, 60, augments in diameter, so as to require less rapidity of revolving motion for winding up, but the weight of the accumulating paper around the axis, 60 increases the pressure with which the said wheels are held in contact so as to give more force of adhesion. And note, the said pressure can be regulated at pleasure by a small bearing lever, 62, acting upon the end pivot of the axis, 60, to increase the pressure upon the wheels beyond the mere weight of that axis, with a weight hung upon the lever, in the manner of a steelyard. The paper accompanying a considerable portion of the blanket-covered surface of the platten-cylinder, R, will have as much adhesion thereto as is necessary for drawing the paper into the machine by unwinding it from off the scroll, 54. Therefore the winding up scroll, 60, only requires to draw the printed paper with a very moderate force so as to keep it tight and cause it to wind up evenly in the new scroll which is to be formed of the printed paper. The other scroll, 54, from which the blank paper is pulled off, should have a slight retarding force applied to the revolving motion of it axis, by means of a wheel fixed thereon, with a friction spring applied to press on the circumference of the wheel by action of a regulating screw, so that the force of the spring can be increased at the discretion of the attendant, suitably for retarding the turning of the scroll and extending the paper as much as is requisite for entering the paper properly between the type-cylinder and the platten-cylinder in order to be printed. And the attendant must keep watch upon the paper as it passes between the cylinders to observe whether it keeps a straight course, and if it shews any disposition to run away to one side or the other, he can correct that tendency by adjusting the position of the axis, 54, moving it a little endways one way or the other in the direction of its length, by turning a setting screw, 63, which is provided opposite to one end of the axis, 54, with a re-acting spring at the opposite end, and two other like screws are provided, one, 64, for raising or lowering one end of the axis, 54, and the other 65, for setting one end of that axis nearer to, or further from, the type-cylinder. Wherefore,

by means of those two adjusting screws, 64, 65, the axis, 54, of the scroll can be placed exactly parallel to the axes of the type-cylinder and platten-cylinder at the commencement, in order that the paper may pass straight through the machine, and then any slight lateral deviation from that straight course which may afterwards arise in the course of the printing can be corrected as it arises by adjustment of the end screw, 63. And note, when the scroll of blank paper is all drawn off and printed, then another like scroll of blank paper must be put into its place to be printed in turn; and, in order to facilitate the introduction of succeeding scrolls, the same mode may be used as is commonly practised in paper-making machinery for mounting the reels whereon the paper is gathered and wound up, viz., the bearings in which the ends of the axis, 54, of the scroll is mounted, are formed at the extremities of two arms, 66, which are mounted upon a horizontal axis, 67, and the opposite ends of the same arms have like bearings for receiving the axis of another scroll, 68, so that two scrolls, 54 and 68, are mounted at once, whereof only one, marked 54, is supplylug paper to the machine, but the other, 68, is monnted in preparation; and when all the paper of the scroll, 54, is unwound then, by turning the arms, 66, half round, about their axis, 67, the exhausted scroll, 54, will be removed instantly, and the full scroll, 68, brought into its place, and the end of the paper thereof is to be entered into the machine, as before described. The axis, 60, with the scroll of printed paper around it must also be removed, and replaced by another like axis, to which the end of the new scroll of paper is to be attached in order to wind up another succeeding scroll of printed paper as before. The arms, 66, are detained in their proper places for presenting the scroll to the machinery by means of a latch, 69, as shewn in sheet VIII.; and the same figure shews how the adjusting screws, 63 and 65, are applied to the bearings at the ends of the arms, 66, the screw, 64, being applied to the bearing of the axis, 67, of the arms; that axis has handles upon the end of it to turn it round by, when the latch, 69, is released by lifting up its handle so as to exchange the empty scroll, 54, for a full one, 68, and then the latch, 69, detains the arms, 66, again. By this method the scroll of paper is printed on one side with a series of impressions, following one after the other on the paper, which is rolled up again as fast as it is printed in a new scroll, 60, and that being removed from the machinery, is to be unwound and wound up again (the proper side being kept ontermost) in another new scroll, in preparation for printing the other side of the paper. The intention of so unwinding being to cause the paper to enter into the machinery at the second time, with the same end of the paper foremost as went foremost the first time. The said unwinding and winding up again may be performed by the same method, before described, for

damping the paper, and as shewn in sheet V., but without passing the paper between the rollers, 52 and 53, carrying it direct from the scroll at 50, to the scroll at 54, unless the printed paper should have become so dry since it was printed as to require damping again, or otherwise, the said rewinding may be done by winding up on the axis, 54, when the same is mounted in its bearings at the ends of the arms, 66, by means of a small handle applied on the end of the axis, 54, for that purpose. And note, in every case of winding up to form a scroll in preparation for printing, the paper must be carefully watched as it is winding, and, in order to wind it evenly, the axis from which it is unwound, or else that around which it is winding up to form a scroll, should be regulated endways by an adjusting screw, as before explained respecting the screw, 63, which is for that purpose, and also suitable retardation by friction, produced either by the regulated pressure of a weight, or of a spring, should be applied to the axis of the scroll from which the paper is unwinding, in order to wind it up with due tension in the new scroll. This care should be taken in the use of the damping apparatus, sheet V. The paper, being thus prepared for printing the second time, is introduced into another similar machine, having the types on its cylinder suitably arranged, or the same machine after the types on its cylinder are suitably arranged, or after its type-cylinder has been exchanged for another with types duly arranged. The end of the printed paper is entered into the machine and the paper is passed through and printed at the second time in the same manner as already described respecting the first time, and must be watched in going in to keep it straight, and even during its passage, and also the retardation of the scroll from which it is unwinding must be regulated by that screw, before mentioned, which increases or diminishes the force and consequently the friction of the spring by which the retardation is produced, in such manner as to keep the paper to an uniform tension, and from time to time, the motion of the machine may be stopped or retarded during the progress of printing a long scroll of paper, as may be requisite in order to examine whether the margin of the second impression correspond to those previously printed at the opposite side of the paper, or, what is termed by printers, if good register is preserved, and accordingly as the second impression may be found by such examination to be gaining or loosing upon the first impression the retardation of the scroll must be regulated by the said screw so as to rectify the tendency to depart from good register before it becomes considerable. And note, according to the degree of tension which the paper requires, so the force with which the winding up scroll at 60, is turned must be regulated by the weight and steelyard lever, 62, before mentioned, in order to draw the paper away from the platten-cylinder with a force somewhat proportioned to the retard-

ing force which is applied to the unwinding scroll from which the paper is pulling off; this latter regulation does not require to be very exact, but only so near to a balance that the paper will not be caused to slip around the blanket-covered surface of the platten-cylinder, by too great a disproportion between the force of winding up, and the retardation to the unwinding. The paper which has been printed on both sides, and gathered in a scroll in this manner, will afterwards require to be cut across to divide into separate sheets, at the proper places where the blank intervals are left between the several successive impressions. The cutting may be performed by unrolling the scroll and cutting the paper across at the proper places by large scissors moved by the hand and directed by the eye of the workmen. Or otherwise, additional machinery may be applied to the machinery which prints the second side of the paper, in order to cut the paper into sheets instead of winding up the twice printed paper in a scroll, in which case the detached sheets being delivered by the cutting machinery at the same rate that successive impressions are printed; such a sheet may, from time to time, be examined to ascertain if the machinery is preserving register, without stopping or retarding the machinery for such examination, and according as the second impression may be found to be gaining or losing upon the first impression, the retarding force to the motion of the scroll of once printed paper which is unwinding can be regulated as before mentioned. The cutting machinery will draw the paper away from the platten-cylinder as fast as that cylinder will deliver out the paper.

Fourthly, respecting that part of my improvements whereby the long piece of printed paper, last mentioned may be cut up into detached sheets at the completion of the printing of the respective portions of that paper, by the methods hereinbefore and hereinafter described. The machinery for this purpose is represented in sheets V., VI., and VII. And note, although it is represented in sheet VII. as applied to, and acting in concert with, the machinery represented in sheets VIII. and IX., which is for printing the paper on both sides in passing only once through the machinery, according to the fifth article of these improvements, nevertheless, the same cutting machinery is equally applicable to the printing machinery represented in sheet IV., to be used therewith when the paper is printed the second time, for cutting it up into detached sheets. The completely printed paper, as it passes out from between the type-cylinder and the platten-cylinder, is conducted over a large revolving reel, 70, whereof the circumference is equal to the length of four of the sheets into which the paper is to be divided, and after passing about half round the reel, 70, the paper is thereby brought within reach of nippers, 71, 71, which take gentle hold of the two edges of the paper near to each of the places where it

is to be cnt off, taking hold a little behind that place in the direction in which the paper is moving; and the said nippers, 71, being affixed to two endless chains, 72, 72, which circulate over a series of pulley-wheels, the nippers, 71, are carried forwards along with the paper after they have taken hold thereof, and they keep hold whilst the paper is cut, and afterwards, until they deposit the several sheets which are cut off in a heap or pile, or at least assist the persons who attend the machine in so depositing the sheets as they are cut off, the nippers releasing their hold of the paper when so deposited. The large reel, 70, and the endless chains, 72, 72, are moved with a suitable speed for taking away the paper, just as fast as the platten-cylinder and type-cylinder deliver out the same; for this purpose a long endless chain, 74, is applied around a pnlley-wheel, 75, which is fixed on the end of the axis of the platten-cylinder, and also around a like pulley-wheel, 76, of the same size, which is mounted on a stud centre-pin, 73, and has a pinion, 77, affixed to it, to turn a spur wheel, 78, of four times the size and number of teeth fixed on the end of the axis of the reel, 70. The pulley-wheels, 75 and 76, have notches around their circumferences to receive the joint pins of the chains, 74, and prevent any slipping, so that the operation of the chain, 74, will he like that of toothed wheels to canse the reel, 70, to be turned once round during four revolutions of the type-cylinder. The chain, 74, also passes around a pulley, 77, on the end of an axis which passes across the machine, and which has two pulleys upon it with teeth or points around their circumference for actuating the endless chains, 72, 72; and those chains being extended over pulleys, 79, 79, their upper portions will lie in a horizontal plane over a sort of table, 104, on which the detached sheets are to be collected in a pile. The two chains, 72, 72, are united by cross bars, 80, situated at intervals apart abont equal to gnthle the of the sheets which are to be cut off, and on each end of each such bar, 80, one of the nippers, 71, is placed; and, when they take hold of the paper, the cross bar, 80, keeps them properly extended for the width of the sheet. The endless chains, 72, 72, pass close beneath the reel, 70, so as to bring the nippers, 71, in contact with the paper whilst it is extended around the reel, 70, and where the paper approaches the lowest part of the circumference of that reel. The nippers are each composed of two pieces jointed together so as to open and shut like pliers or pinchers, hut having broad flat surfaces which shut together like a finger and thumb to hold the paper between them, those surfaces being lined with India-rubber in order that the parts which take hold may be soft and elastic. A bow-spring is applied to each pair of jointed pieces in snch manner as to hold the nippers open when they are opened, or the same spring acts to keep them closed when they are closed. One of the jointed pieces is fixed

fast to the cross bar, 80, and the other jointed piece has a tail projecting out at the opposite side of the centre joint for opening and shutting the nippers, which is done as they go round with the endless chains by being brought into contact with fixed guides suitably placed for opening the nippers, or for shutting them, according as they are required to take hold of the paper or to let go. The nippers are brought by the chains, 72, 72, with their mouths wide open until they fall in with the paper upon the reel, 70, so as to include the same within their open mouths, and the nippers are then suddenly closed by action of the fixed guides, against which their tails are at that moment brought into contact, and their springs will afterwards keep the nippers closed to retain a gentle hold of the edge of the paper a little before and after it is cut. The cutting is performed by a knife, 81, which cuts all across the width of the paper with an instantaneous slash, acting upwards from below, the edge of the knife then entering into a crevice between two straight edges which are fixed parallel to each other on the circumference of the reel, 70. There are four such cutting places around the reel, 70, at equal distances apart, forming four of the eight rails of the reel. The same cutting knife, 81, serves for them all, acting with each cutting place as the same comes in its turn to the lowest part of the circumference of the reel. And after having made its cut upwards into the said crevice, and cut the paper across, the knife, 81, is withdrawn downwards therefrom as suddenly as it was slashed upwards, in order to allow the reel to move on; but the said action of the knife does not require any pause to be made in the motion of the reel, which continues to move regularly forwards with the paper because the knife, 81, accompanies the reel, 70, a little way in its motion, and makes its cut whilst so accompanying, and then after being withdrawn downwards out of the way of the paper, the knife returns in an opposite direction in order to regain a situation in which it will be ready for repeating its cutting action. For this purpose the knife is fitted into a sheath formed by a narrow interval between two parallel pieces, 82, 82, supported at the upper ends of two arms, 92, which are mounted on a horizontal axis, 83, situated parallel to and nearly beneath the axis of the reel, 70, being sustained in suitable bearings on the same frame. On the extreme end of the axis, 83, a toothed pinion, 87, is fixed, and its teeth are engaged by those of a toothed sector, 84, which is mounted on an axis fixed to the frame, and has two lever-arms, 85, radiating upwards from its centre, with truck-rollers at the upper end of each arm, to be actuated by two camms, 86, 89, which are fixed on the axis of the pulley-wheel, 76, before described. One of the camms, 86, by its curvature, moves the sector, 84, one way, so as by the pinion, 87, and axis, 83, to move the sheath, 82, of the knife, 81, in a proper direction for accompanying the mo-

tion of the paper, and the curvature of the camm, 86, must be such that it will cause the sheath, 82, of the knife to accompany the motion of that cutting place on the reel which is then coming downwards into the cutting position, and with such precision that the knife will come exactly beneath the crevice into which it is intended to cut downwards; the said crevice being above the paper which is extended around the reel, and the knife being below the paper, and for certainty of the knife thus coming precisely below its corresponding crevice, a prominent tooth, 88, is fixed on the reel at each end of each of the crevices, but beyond the width of the paper; and those teeth enter into corresponding openings in each end of the crevice,'which forms the upper part of the sheath, 82, of the knife, their action being like the teeth of a pair of cog-wheels, so as to ensure a correspondence in the motion of the knife and of the reel, for a moment before, and a moment after the cut is made. And after the knife, 81, is withdrawn again into its sheath, 82, the camm, 86, by its curvature ceases to impel the said sheath, 82, any further in the direction in which the paper is moving, and then the other fellow camm, 89, acting on the truck-roller of the other lever-arm of the toothed sector, 84, moves it in a contrary direction, and thereby brings the sheath, 82, of the knife back into a suitable position for being moved forwards again by the camm, 86, in due time to meet the next cutting rail of the reel, 70, which is in its turn coming round to the cutting position, and bringing with it as much more paper as when cut off will make another sheet. The sudden slashing motion by which the knife, 81, is urged upwards out of its sheath, 82, to cut the paper, and then instantly drawn down again into that sheath, is communicated from two cranks, 90, at the opposite ends of a horizontal axis, 91, which is mounted in bearings at the lower ends of the same two arms, 92, by which the sheath, 82, of the knife, 81, is affixed to its axis, 83; the crank axis, 91, being beneath the axis, 83, and partaking of the vibrating motion of the axis, 83, as well as of the sheath, 82, for the knife, and from each crank a small crank rod or link, 93, is extended upwards and jointed to the two ends of the knife, 81. Note, the crank rods, 93, are bended so much as is requisite to avoid striking the axis, 83. By this arrangement when the axis, 91, of the two cranks, 90, is turned once round, the cranks, 90, by their links, 93, will urge the knife, 81, upwards out of its sheath, 82, to make it cut through the paper, and will then draw the knife down again into that sheath. The axis, 91, is turned suddenly round by means of a coiled spring, like that of a watch or clock, which is contained in a spring box, 94, fitted upon the axis, 91, with the interior end of the spring attached thereto, and the outer end is attached to the box, 94, which, excepting that connection with the axis, is free to turn round thereon. The axis, 91,

has a steel arm, 100, fixed fast to it, and the extreme end of that arm (which end is bended laterally) stops against a curved stop, 101, which is fixed fast to a cross rail of the frame, and the axis, 91, is thereby detained from turning round by the force of the spring in the box, 94, although that spring is always kept wound up in readiness for turning the axis, 91, and its cranks, 90, suddenly round in order to make a slashing cut with the knife the instant that it is permitted to do so, and that instant is determined by the vibrating motion of the knife and its sheath, 82, in which the axis, 91, participates; for at the same time that the knife in its motion along with the reel, 70, and the paper arrives at the position where it is to make its slashing cut, then the bended end of the detaining arm, 100, of the axis, 91, by the vibrating motion thereof passes off from the end of the fixed curved stop, 100, so as to allow the axis, 91, and its cranks, 90, to be turned round by the force of the wound-up spring, 94, with a very rapid motion, whereby the cranks, 90, and their links, 93, cause the slashing cut of the knife, and the return thereof into its sheath. When the axis, 91, has thus made one turn, the bended end of its arm, 100, comes against another fixed curved stop, 102, which intercepts and detains it and the axis, 91, from moving further in the same manner as the other stop, 101 did, but in the course of the vibrating motion of the axis, 91, the said bended end of the detaining lever, 100, will swing beyond the end of the fixed stop, 102, and allow the said end to drop off from the same on to the other stop, 101, in which state the axis, 91, and cranks, 90, of the knife will stand prepared for a repetition of their slashing cut when required to cut again. It now only remains to explain how the spring, 94, is kept continually wound up and ready for action. A toothed pinion, 95, is formed on one side of the box, 94, to be worked by a cog wheel, 96, of six times its size and number of teeth, which is fitted loose upon the axis, 83, and has a ratchet wheel, 97, of six teeth fixed to it, those teeth are engaged by a driver, 98, which is jointed to the upper end of one of the arms, 92, of the axis, 83. A click, 99, acts in the teeth of the same ratchet wheel, 97, it is jointed to a fixed cross bar of the frame, and acts to prevent the ratchet wheel moving backwards. The driver, 98, acts in one of the teeth of the ratchet wheel, 97, to connect that wheel with the axis, 83, so that the wheel will partake of the motion of that axis whenever the same is moved by action of its camm, 89, in order to carry the sheath, 82, of the knife, 81, in a contrary direction to the motion of the reel, 70, and the paper; but, on the contrary, the click, 99, catching in another tooth of the ratchet wheel, 97, will prevent that wheel recoiling when the knife, 81, is moved along with the paper by action of its camm, 86, for then the ratchet-wheel, 97, and its cog-wheel, 96, become immoveable, whilst the axis, 91, of

the cranks, 90, and the pinion, 95, of the spring-box, 94, are partaking of the swinging motion of the axis, 83. In consequence of the pinion, 95, acting thus on the teeth of the immoveable wheel, 96, that pinion and its spring-box, 94, are turned round on their axes, 91, and thereby they wind up the spring in the box, 94, just one turn, but notwithstanding that turning of the pinion, 95, and winding up of the spring no motion will thereby be communicated to the axis, 91, and its cranks, to turn them round, but that axis is detained by its arm, 100, and fixed stop, 101, from turning round, as before explained, until the knife arrives at its proper position for making another cut, and then the arm, 100, drops off from its stop, 101. It has been already explained, that the nippers, 71, take hold of the paper an instant previous to the cut being made, but a little after the place where the cut is made; wherefore after every cut the sheet which is detached thereby is still held in the nippers by its edges, near to that end of the sheet which is going foremost, and also the foremost end of the uncut paper which wraps round the reel, will, in like manner, be held by the nippers, 71, near to its foremost end, and by the motion which the nippers, 71, derive from their endless chains, 72, they will draw forwards the paper, and keep it adhering to the reel, 70. And when the nippers, 71, have thus carried forwards the end of the uncut paper the length of another sheet then, by another cut of the knife, 81, that sheet is cut off, another succeeding pair of nippers having in the meantime advanced and taken hold of the uncut paper an instant previous to cutting, but at a small distance behind the place where the cut is made; and in order to deposit the sheets which are so cut off in a heap or pile one over the other, the nippers, 71, are caused to open and leave the sheets which they had previously held and carried forwards by the motion of their chains, 72, at the moment when the said sheets arrive over the table, 104, on which they are to be deposited. That table is mounted on springs, 195, so as to be buoyant, in order that it may admit of pressing it down as the sheets accumulate, and form a heap upon it. The pairs of nippers, 77, which hold the opposite edges of each sheet are opened by fixed guides, 196, beneath which the tails of the nippers are carried as they move along with their chains, 72; and when the said nippers are so opened, they leave the sheet (which they had previously held) quite loose, that it may drop by its weight upon the heap on the table, 104; but as that would be uncertain, two bearers-down, 106, 107, which act like hands, are brought down upon the foremost and hindmost ends of the sheet, at the very instant when the nippers are opened. The said bearers-down, 106, 107, are affixed by lever-arms to two horizontal axes, 108, 109, which extend across the frame and are actuated by two camms, 110, 111, fixed on the axis of the same pulley-wheel, 77, before mentioned, from which the end-

less chains, 72, 72, derive their motion, the camm, 110, acts by a lever, 112, on the axis, 108, of the bearer-down, 106, to urge the latter down upon the loose sheet of paper at the proper moment; and the camm, 111, acts by a lever, 113, on a long link, 114, and lever-arm, 115, on the axis, 109, of the other bearer-down, 107, to urge the latter down upon the same sheet at the same instant when the bearer-down, 106, acts thereon, as before mentioned, and, by their conjoined action, the loose sheet is borne down on the pile and aggregated thereto in an instant after the nippers have let it go, and then the camm, 111, allows its bearer-down, 107, to fly up again instantly, by action of a spring, 116, in order to get out of the way of the next following sheet and pair of nippers which is coming forward. The other bearer-down, 106, is kept down a little longer until it is also required to get out of the way of the next sheet, and then its camm, 110, allows it to fly up. The bearers-down, 106, 107, depress the buoyant tables as the pile of sheets accumulates, and there are serrated racks with fine teeth and spring cliks to them for holding down the table and restraining it from rising up when the bearers-down rise up from it. It is intended to have a person always in attendance on this part of the machine to assist and keep the sheets smooth and to avoid doubling the ends. The buoyant table, 104, is fitted in a frame which slides laterally across the machine like a drawer, with two such buoyant tables, 104, upon it side by side, and when a pile is formed upon one table, 104, the drawer is pulled out sideways to remove the pile, and the same motion brings the other table, 104, into its place for beginning a new pile. Note, the motion of the nippers, 71, by their endless chain, 72, should be a very little quicker than the actual motion of the paper, and the distance between the nipper should be a very little more than the length of a sheet, in order to allow for slipping and to keep the paper extended to a full measure.

Fifthly, respecting that part of the improvements whereby both sides of the paper may be printed by modification and duplication of the machinery constructed according to the improvements hereinbefore described, while that paper is passing once through the machine. The machinery for this purpose is represented in sheets VIII. and IX. of the drawings hereunto annexed, and the parts thereof being very similar to those before described, a brief explanation will be sufficient. A second platten-cylinder, 120, is applied immediately behind the platten-cylinder, R, and in contact therewith, and a second type-cylinder, 121, is applied immediately beneath the second platten-cylinder, 120, all being sustained in the same frame; also a second inking apparatus is applied behind the second type-cylinder, 121, the only difference in that inking apparatus being the introduction of an additional soft cylinder or roller, 122, to cause the surfaces of

the rollers, 31, 32, and 33, which apply to the types, to move in the same direction with the types. The paper is first introduced from the scroll, 54, between the type-cylinder, 1, and its platten-cylinder, R, and is thereby printed on one side, then the paper passes down between the platten-cylinder, R, and the additional one, 120, but without being pinched between them, and passing under the latter, and between that and the additional type-cylinder, 121, the paper receives the other impression on the other side, and then it passes away to the cutting machinery, represented in sheets VI. and VII., which has been already described. And note, in order to cause the second impression to make register with the first, the cog-wheels on the ends of the axes of the respective type-cylinders are not fixed fast on their axes, but have arms fixed fast on them with setting screws by which the wheels can be suitably adjusted on their axes. The mode of feeding the machinery with paper from scrolls is the same as hereinbefore described. And the mode of bringing the platten-cylinders into action by eccentrics, S, S, with a handle, T, is the same, but the weight of the additional platten-cylinder, 120, requires to be balanced by counter levers, 123, and springs. The wheel-work for giving motion to the additional platten-cylinder, 120, and type-cylinder, 121, and the additional inking apparatus is sufficiently represented in sheet VIII.

Sixthly, respecting that part of the improvements whereby two impressions may be printing at the same time on two distinct papers from the same revolving type-cylinder. The machinery will be the same as is represented in the drawings and as hereinbefore described, with the addition of another platten-roller and another inking apparatus to the same type-cylinder. Those additions being respectively on opposite sides of the axis of that type-cylinder, whereby it will be rendered capable of printing impressions from off the two opposite sides of its circumference at the same time. The dotted circle, 125, sheet IV., represents the place for such an additional platten-cylinder over the type-cylinder, 1, and the dotted circles, 126, represent the position of the additional inking apparatus to the same type-cylinder. The additional paper which will be printed by such an additional platten-cylinder and inking apparatus, will move through the machine in a contrary direction to the other paper which is printing at the same time, and the additional paper may be supplied from a scroll at the back of the machinery, and wound up when printed in a scroll at the front thereof. And in the same manner the dotted circles, 125, and 126, in sheet IX., represent the places of an additional platten-cylinder and inking apparatus when the same are applied to the machinery hereinbefore described for printing on both sides of the paper at once. But the additional paper which is printed at the same time by such an additional platten-cylinder and inking apparatus will only be printed

on one side in the same manner as would be done by the machinery represented in sheet IV., and hereinbefore described, but another additional platten-cylinder may be applied at the place shewn by the dotted circle, 127, to act with a type-cylinder, 121, and the dotted lines, 128, shew the place of another additional inking apparatus for the said type-cylinder, 121. The additional paper which is printing at the same time, by such other additional platten-roller and inking apparatus will only be printed on one side, wherefore the complete machine will have three distinct streams of paper flowing through it at the same time, whereof one will be printed on both sides, and completed, and may be cut up into detached sheets, in the manner hereinbefore explained, but the other two will be printed only on one side of each paper, and must be gathered up in scrolls after being so printed in the same manner as already described respecting sheet 4, but after the two additional papers have been so printed and gathered up in scrolls, the same being unwound and made up anew into scrolls and exchanged one sort for the other, may be passed through again in order to be printed on the second side of each paper by the additional platten cylinders and inking apparatuses, in the manner hereinbefore described of printing a second time by the machinery represented in sheet IV., that is to say, the paper which was printed on one side by the uppermost additional platten cylinder from the upper type cylinder must at the second time be printed on its other side, by the lowermost platten cylinder to the lowermost type cylinder, and vice versa, and the papers so printed a second time must be gathered up in scrolls in the manner hereinbefore described, respecting machinery represented in sheet, W.

Further note respecting the first part of the improvements. The occasional binders with tenons x, sheet II. hereinbefore described, may, if required, be used with the chases, sheet I., in the same manner as with the galleys, sheet II., proper grooves being in such case cut in the sides of the chases to receive the tenons, and leads, 135, sheet II., may be inserted between the lines of type for wide printing, such leads being held in their places by the lateral pressure at the end of the page or column as already described, and may be still further secured if necessary by having a slight horn or projection at each end corresponding with the hooked projections to the binders, *r*, sheet II., and ranging with the said hooked projections when in use. In printing newspapers when it is required to print a title or heading, which will not all be included within the side boundaries of the columns of type, the said title or heading may be formed upon a small stereotype plate formed to the cylindrical curvature, and this plate may be supported by, and screwed down upon proper blocks of wood introduced into the galleys at the head of the columns of type, and partake of

the screw pressure which bears upon the type to fasten it in the galley.

Having now described the nature of my said invention, I, the said Rowland Hill, do hereby declare that the new invention or improvements whereof the exclusive use is granted to me by the said letters patent consist,

First, in the improvements hereinbefore described in certain methods of letter-press printing, by which moveable types are securely fastened, so that their printing surfaces shall be in conformity with a true but supposed cylindrical surface forming when so fastened a revolving type cylinder.

Secondly, an improvement in the methods of letter-press printing for supplying ink in the manner hereinbefore described to revolving cylindrical printing surfaces. The essential character of the improvement being to turn the ductor roller at a slower speed than the other inking rollers, while at the same time all the inking rollers (the ductor inclusive) are kept in contact not occasionally but constantly. The object aimed at in this improvement is to give a supply of ink to the types, which shall be at one and the same time constant and under perfect regulation by the worker of the machine.

Thirdly, an improvement in the methods of letter-press printing, which consists in feeding the type cylinders with a large scroll of paper in the manner hereinbefore described.

Fourthly, an improvement in the methods of letter-press printing, which furnishes the means of cutting up the said scrolls in a manner hereinbefore described into separate sheets or leaves after they are printed upon.

Fifthly, an improvement in the methods of letter-press printing which consists in printing both sides of the paper in the manner hereinbefore described, whilst the same is passing once only through the machinery.

Sixthly, an improvement in the methods of letter-press printing by which two impressions are respectively

printed in manner hereinbefore described, upon two distinct papers at one and the same time from the same type cylinder. And here note, generally, that the machinery to which the improvements now recapitulated apply is machinery for letter-press printing with moveable types arranged round a cylinder, and conforming in whole or in part to a supposed but true cylindrical surface revolving continuously, except where, by reference to the detailed parts of the specification, such limitation is repugnant to the sense. Note also, that it has been found convenient to speak of platten cylinders as placed above or below type cylinders, though other relative positions may be found practicable and possibly convenient.—In witness whereof, &c.

Enrolled August 12, 1835.

[The following specification is of a much older date than we are in the habit of inserting them; but knowing that it is about to become the subject of a special application to the Judicial Committee of the Privy Council, for an extension of the term of the patent, we have given it now prior to the commencement of the proceedings instead of waiting to append it to the account of them, to enable the patentee, at a very small cost, to lay copies before the council.]

Specification of the Patent granted to JAMES TULLOCH, *of Savage Gardens, in the City of London, Gentleman, for an improvement or improvements in the Machinery to be employed for sawing and grooving Marble, and other Stone, or in producing Grooves or Mouldings thereon.*—Sealed April 12, 1824.

WITH AN ENGRAVING.

To all to whom these presents shall come, &c. &c.—*Now know ye*, that in compliance with the said proviso, I, the said James Tulloch, do hereby declare that the na-

ture of my said invention, and the manner in which I practise or carry the same into effect, are fully described and ascertained by the annexed drawings, and the following description thereof in writing, (that is to say):

The nature of my invention consists, first, in causing the reciprocating frame which holds the saws or grooving tools I employ in cutting, or in ornamenting marble or other kinds of stone, to descend as the cutting or grooving process advances, so as that the said frame shall at all times reciprocate or move forward and backward in an horizontal direction, and parallel with the edges of the saws or grooves in the grooving tools, or nearly so; and in such a manner as that although the block of marble or other stone may be softer at one end than at the other, the cutting by the saws, or grooving by the tools, shall not proceed faster at the softer than at the harder end of the block:—and secondly, in the operation of sawing only, in causing each end of the saw frame to rise a little, nearly at the end of every alternate motion, so as that each end of all the saws affixed to, or carried by, the said frame, may alternately be lifted upward a little, for the purpose of allowing the sand and water (the use of which is well understood by all sawyers of marble or stone) to be more freely introduced, between the stone to be cut and the lower edges of the saws, than is practicable when the said frame and saws are made so as not to rise. Before describing the manner in which I practise and carry my said invention or improvements into effect, I will here premise that for the sake of more clearly explaining the same, I have hereto annexed drawings of the whole of the machinery I employ in sawing and grooving marble or other stone.

Description of the Drawings.

Fig. 1, in the said drawings, is an elevation or side view of two frames, one with saws and the other with grooving tools; and in this figure also is shewn the wheel-work

and cranks for working or putting the said saws and grooving tools into motion.

Fig. 2, is a plan or sectional view of the same taken horizontally.

Fig. 3, is an end view of the grooving frame, and

Fig. 4, is a drawing, upon a larger scale, of the apparatus attached to each corner of the saw frame, as shewn at 1, 2, 3, 4, 5, and 6, in fig. 1. And I will also premise that in each of the said drawings or figures, I shall hereinafter make use of the same letters or marks of reference to denote the same thing, wherever it can conveniently be done. These several drawings I shall now proceed more particularly to explain. In figs. 1 and 2, A, A and A, A, are two long sills or pieces of timber upon which the saw frames are fixed. B, B, is another piece of timber for supporting the upper part of the saw frames and other parts of the machinery hereinafter described. D, D, D, D, D, D, are six pieces of timber laid across the building for supporting the spindles, &c. shewn in the drawing, and which will also hereinafter be described. C, is one of the two wall plates or pieces of timber upon which the said cross pieces, D, D, &c. rest. E, E, E, E and E, E, E, E in fig. 1, are side views of two cast iron frames standing upon and fixed to the sills, A; a cross section or end view of one of the said frames is shewn also in fig. 3. The four corner pieces or posts of the said frames are also denoted by the letter, E, in the horizontal section of the same in fig. 2. The frames for holding the saws or the grooving tools, and which I have hereinbefore called the reciprocating frames, are shewn in figs. 1, 2 and 3, and are marked by the letter, F. In each of the aforesaid fixed frames, E, E, &c., I employ two cast iron frames one of which is shewn in fig. 3, at G, G, G, G, and the position of the said frames is also shewn at, G, G, G, G, in fig. 2, and by the dotted lines marked G, in fig. 1. The aforesaid frames, G, are made so as to slide up and down, and for this purpose their

Tullochs Patent.

Fig. 1

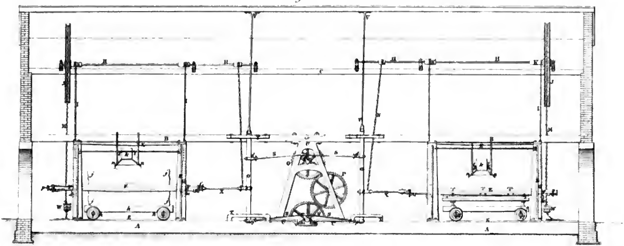


Fig. 2

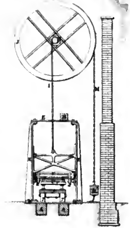


Fig. 3

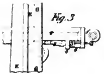
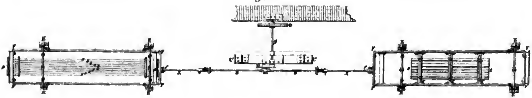


Fig. 4



sides are made parallel, and are fitted into grooves in the upright posts of the fixed frames, E, as is shewn in fig. 2. I employ the said frames, G, for the purpose of supporting the reciprocating frames, F, and for guiding them in their reciprocating motion; and to this end, I attach to each of the said frames, G, the two rollers, *a, a*, as shewn in fig. 1 and 3, for the support of the reciprocating frames, F, so that there are four such rollers to each of the frames, F. I also attach to each of the said frames, G, two other rollers, *b, b*, as shewn in figs. 3 and 2, with their axes in a vertical position so as to guide the said frames, F, laterally. In fig. 1, H, H, and H, H, are two iron spindles lying horizontally nearly over the middle of each of the aforesaid fixed frames; and upon each of the said spindles, H, H, is hung the wheel, J, the two rollers or barrels, K, and the roller, L. To each of the rollers, K, I fasten a chain, and to the lower end of each of the said chains I append one of the aforesaid frames, G, in the manner shewn in fig. 3, taking care that the chains are of such a length as to raise the reciprocating frames, F, to the proper height, and keep them in a horizontal position. To the ring or groove in the edge of the wheel, J, I fasten the upper end of the chain, M, and to the lower end of the said chain, M, I append the balance weight, W, so that the said weight may in part act as a counterpoise to the frames, G, G, and F, F. But as these, whenever they are at work, ought to preponderate so as that the saws or grooving tools may act with sufficient weight or force against the stone to be cut, and as this preponderating force must be greater or less according to the number of saws employed in one frame at a time, is, more or less, or according to the greater or less breadth of the grooving tools, the counter weight, W, must be varied. I therefore make use of a number of smaller weights of lead or cast iron of such a shape as to render their application to, and their removal from, the chain at W, easy and convenient.

I shall now describe the machinery I employ for putting the reciprocating frames into motion. As a first mover, I employ a steam-engine of six horses power, which I find sufficient for working two of the said reciprocating frames. In fig. 1, at P, is represented a wheel put into motion by the said steam-engine (but any other first mover of sufficient power would answer the same end), Q, Q, are two other wheels, each having the same number of teeth and are turned by the wheel, P. The axle of one of the wheels, Q, is shewn at, *g*, in fig. 2. The other wheel, Q, has a similar axle. Upon the end of each of the said axles is a crank, as shewn at R, R, in fig. 1, and at R, in fig. 2, each crank being of the same radius. S, S, S, S, are four connecting rods two applied to one crank and two to the other. O, O, are two upright bars of iron suspended by the two radius bars, V, V and V, V, as shewn at fig. 1. The upper ends of the said bars, V, are fastened by joint pieces to the top of the building as shewn in the drawing. The lower ends of the said bars, V, are also fastened to the upper ends of the bars, O, by joint pins, so as that the said bars are at liberty to move backwards and forwards in the direction in which the saws are intended to move. Upon each of the bars, O, O, are fixed, by screws or otherwise, the two pieces, *c*, *d* and *c*, *d*, and, to the said pieces *c*, *d* and *c*, *d*, I attach by joint pins the outer ends of the connecting rods, S, S, S, S, as shewn in figs. 1 and 2. To each of the said bars, O, I adapt the two pieces, *e*, *e*. The sides of the said bars, O, being made parallel, mortices are made in each of the pieces, *e*, *e*, through which the bars, O, pass, and in such a manner as that the pieces, *e*, may slide or move freely up or down upon the said bars, O. X, X, are two connecting rods with a joint at each end, one end of each being fastened to the reciprocating frames, F, F, at *f*, *f*, and the other ends thereof to the pieces, *e*, *e*, as is shewn in the figs. 1 and 2. To the pieces, *e*, *e*, I also attach the lower ends of the chains,

N, N. The upper ends of the said chains are fastened to, and pass round the two barrels, L, L. The bars, O, O, are held in their respective places laterally by the four guide pieces, T, T and T, T. Each of the said pieces, T, have slits in them through which the said bars pass, the width of the said slits being equal to the thickness of the said bars, and the length of the said slits is such as to allow the said bars, O, to move backwards and forwards through a space equal to that moved through by the reciprocating frames, F. U, U, U, is a cast iron frame for supporting one end of each of the axles upon which the cranks, R, are fixed, as shewn in fig. 1, and in fig. 2 at U, U. The reciprocating frames, F, are so constructed as that either saws or grooving tools can be applied to them as occasion may require. In fig. 2, at, *s, s,* &c. are represented a number of saws fixed in one of the said frames, and the manner of fastening the said saws to the said frames will be understood by any competent workman on inspecting the drawing wherein the end pieces and tightening wedges are seen at, *p, p.* To the other reciprocating frame, F, I have affixed (or represented them as so affixed) the grooving tools as at, *t, t,* by means of the screws and cross bars shewn at, *r, r, r.* A cross section of the grooving tools is also seen in fig. 3, at, *t, t,* where they are represented as lying upon a slab of marble, U, (coloured blue) to be grooved. 7, 7, 7, 7, denote a four-wheeled truck, which, for the sake of greater convenience, I employ for supporting the slab, and by which the slab is conveyed to and from the grooving frame. In fig. 1, is represented a block of marble, *j, j, j, j,* as undergoing the operation of sawing; the block, *j,* is also represented as lying upon a truck, *h, h, h,* having four wheels. In fig. 1, is also represented the two water cisterns, *k* and *k,* which are furnished with a number of cocks (such as common beer cocks) on both sides, as seen at *l, l* and *l, l*; and to the bottom and on each side of the said cisterns I affix the inclining boards, *n, n, n, n.* The width of

the said cisterns and inclining boards in the other direction, that is across the sawing and grooving frames should correspond to the width of the block of stone to be cut, or the slab to be grooved. During the operation of sawing or grooving a workman is constantly employed in supplying sand of a sharp grit upon the surface of each of the inclining boards : he, at the same time, allows the water from the cistern to be discharged through as many of the cocks as are found requisite, and in such a quantity as will gradually wash off the sand from the boards, and supply to the saws or grooving tools a tolerably uniform stream of water mixed with sand, the sand being the immediate agent both in sawing and grooving. These water cisterns, as is shewn in the drawing, are placed directly over the stone to be cut or grooved, and are fastened by iron straps or otherwise to the top of the frames, E, in fig. 1. The apparatus I employ for causing both ends of the saws to rise a little near the end of their motion, either to the right or left, is shewn at 1, 2, 3, 4, 5, and 6, and it is also shewn on a larger scale in fig. 4, where, E, E, represents a part of one of the upright posts of the fixed frame, E, hereinbefore described : the dotted lines at, G, G, shew the situation of the vertical frames, G, and F is a side view of the end of the reciprocating frame, F. To the underside of the said end I affix the piece marked 2, by the joint shewn at 1, so as that the other end of the said piece 2, may be at liberty to move round the joint pin, at 1, and thereby be placed at any required angle with the lower side of the frame, F, I mean the lower side or edge of the frame, which is to be made straight, and which lies upon the roller, *a*. Above the moveable end of the piece 2, I place a wedge, seen at 3, and, in order to keep the wedge in its place, I apply the flat staple at 4, which embraces both the wedge and the piece, 2, the staple being rivetted or otherwise fastened to the lower side of the frame, F, as will be understood by the drawing. The piece 2, is held up against

the wedge by the spring 6, and the wedge is forced in and held at the proper place by the screw 5. A similar apparatus to that which I have described, and which is delineated at, 1, 2, 3, 4, 5, and 6, is applied to each corner of the reciprocating frame, F, whenever saws are to be employed; but they are not required and therefore not used when the grooving tools are applied. From the description of this apparatus and by inspecting the drawings, it will be understood that the frame, F, when in motion and sliding or rolling over or upon the rollers, *a*, and whenever the piece 2, (having the inclination represented in the drawing) is brought upon the roller, *a*, it will cause that end of the frame, F, to which it is applied, to rise, together with the corresponding ends of all the saws which may then be fixed in the said frame, thus allowing the water and sand to pass the saws and be deposited below them upon the part of the stone to be cut. When the grooving tools are used, the water and sand are introduced between the opposed surfaces of the tools and the stone, by several holes or perforations through the said tools. It will also be clearly understood from what I have hereinbefore said, and by inspecting the several drawings hereto annexed, that whenever the wheel, P, is put into motion, the wheels Q and Q, and the cranks, R, R, will be made to revolve, and that the revolution of the said cranks will, by means of the rods, S, S, S, S, the bars, O, O, and the rods, X, X, communicate a reciprocating motion to the frames, F. The wheels, Q and Q, having the same number of teeth in each, they will make the same number of revolutions in the same time. The radii of the two cranks, R and R, being of the same length, and placed exactly parallel with each other, they will cause the bars, O and O, to move backward and forward in a vertical position and parallel with each other. And it will also be understood that if the barrels, K and L, be made of the same diameter and the chains properly applied, the frames, F, and the connecting rods, X, X, will

always move in a horizontal direction, or nearly so, throughout the operation of sawing from the top to the bottom of the block, or throughout the depth required in grooving a slab. And lastly, I do declare that although I have hereinbefore described, and have, in the drawings hereto annexed, delineated all the essential parts of the machines I employ for sawing or grooving marble or other stone, I lay no claim to the whole, or any part thereof, either in combination or individually, as forming any part of my said invention or improvements, excepting those parts which I shall hereinafter more particularly set forth; (that is to say,) my invention or improvements consist, first, in an apparatus (one modification of which I have hereinbefore described, and which by experience I have found to answer well) for causing each end of the saws to rise a little, nearly at the end of their reciprocating motion each way; and, secondly, in the rollers, chains, and other apparatus hereinbefore described, as being employed in supporting the aforesaid reciprocating frames, and causing them to move in a horizontal direction, or nearly so.—In witness whereof, &c.

Enrolled October 9, 1824.

LAW REPORTS OF PATENT CASES.

In the Court of Common Pleas, before the Lord Chief Justice Tindal, and a Special Jury.

CORNISH and another *v.* KEENE and another.

[*Concluded from p.* 191.]

Miss Florence Ducoron sworn. Examined by *Sir F. Pollock.*—I am the daughter of Mr. Ducoron. My father had a Frenchman in his service of the name of Descombes; he left in 1832, in April or May. Descombes instructed me to weave. I remember his making the red specimen, of which this is a bit. I assisted my father to find it. We found it in a drawer with other patterns. It

must have been made in December, 1831, or January, 1832. There is cotton between the India-rubber. Descombes and my father made many experiments which I do not recollect.

Cross-examined by *Mr. Attorney General.*—They made experiments. I knew they were making an experiment of this kind. My father considered it too weak. It would take from half an hour to an hour to make three or four yards of that stuff. I cannot say whether it was cut out of the loom; I do not remember seeing it out of the loom. I have seen some that must have been of the same piece, all elastic without cotton between. There never was but one piece made to my knowledge. I saw Mr. Descombes make a red piece, which must have been the same piece of which this must have been cut off, but at the time I did not notice whether it was all India-rubber, or had cotton between; I never examined till I saw that pattern in the drawer.

Re-examined by *Sir F. Pollock.*—It must have been of the piece he made; there never was but one piece of this red stuff made to my knowledge.

Mary Thomson sworn. Examined by *Mr. Creswell.*—I have been in the employ of Mr. Ducoron. I remember the Frenchman, Descombes; he left in 1832. We have braiding machines and looms in the manufactory. I braided that coloured India-rubber, but only one lot; it got the nick-name of the dirty red. I remember it quite well. I did not see it in Descombes' loom, nor did I see the web made.

Cross-examined by *Mr. Serjeant Wilde.*—I still work for Mr. Ducoron; I do not know how long it would take to braid a quantity for three or four yards. I do not know how long I was engaged braiding that dirty red; perhaps a week. I cannot say how much it would produce.

John Harborough sworn. Examined by *Sir F. Pollock.*—I am a brace manufacturer. I am agent to Messrs.

Wood and Westhead of Manchester. I have been so three years. I believe they had some connection with Hancock. I know a woman of the name of Richardson; she suggested to me that she would make webbing in the same way that I was using the brass springs. The webbing is first made, and the brass springs are put in afterwards; but her plan for making the India-rubber was to reel the India-rubber with it at the same time with silk or cotton. I sent her to Manchester to Messrs. Wood and Westhead. I received the article afterwards; that marked, W A, is not the one, but it was precisely similar, but broader; I believe that that piece marked, W A, was sent to me by Wood and Westhead, but it has been pulled about since I had it. I received two widths, an inch and half an inch wide; I cannot state from memory the quantities I received; I should think not more than five or six yards; it came as a sample in 1833; the first date I can refer to is the 9th of March, 1833. I have a letter dated on the 2nd of January, 1833, in which I received a sample of light web; it was alternate, that is, one India-rubber braided with one of cotton. I received this piece of web in January, 1833, but I did not sell goods of that description I should think for twelve months after. The sample-piece I received in January, 1833, was not more than eight or nine inches; I have had it in my possession ever since, till Mr. Morris (the defendant's solicitor) received it of me. The specimen was marked W.

Cross-examined by *Mr. Attorney General.*—I received and opened the letter of the 2nd of January, 1833, myself; no one saw it before me. I do not know that the pattern came in the letter; the piece might possibly be wrapped in paper. The pattern was in a drawer, to which no one had a right to go; it was not locked. I do not think any one saw it. I do not recollect having any goods manufactured on the principle till October, 1834. I will not swear that that which I received in January, 1833, was

not some yards instead of a few inches, but to the best of my recollection it was not more than a few inches. If I received more of that pattern I do not know what has become of it; I sold none of it; I know what the letter says, "a few yards," and am surprised; I remember it was only a small piece. The pattern was new, as far as I know, at that time; I have had a great deal of it since 1834, and it is now in great demand; I only recollect that it was a small quantity. I know the letter says a few yards, and that is what puzzles me. If I received a few yards with that letter it must have been another specimen.

Re-examined by *Sir F. Pollock.*—I do not know for certain when I received this from Messrs. Wood and Westhead: I have no invoice.

Mr. Attorney General.—Don't you know that Wood and Westhead have taken a licence from Mr. Cornish?

Sir F. Pollock.—I object to that question; he must know it from my client.

Mr. Attorney General.—I submit it is a fair question; the witness is an agent of Wood and Westhead.

Lord Chief Justice Tindal.—You must prove the licence in writing.

Re-examined by *Sir F. Pollock.*—I have two specimens before me. It is not generally called one and one, but was the specimen that came in that letter, or came with it at the same time the one and one.

Benjamin Nickel sworn. Examined by *Mr. Creswell.*—I am a machine maker; I am brother to the defendant; I remember my brother going into partnership with Mr. Keene in July, 1831. They then began to make elastic web; they manufactured this web, India-rubber, with cotton braided over that marked No. 1. I altered an old machine according to that model; it was at the end of April or beginning of May, 1832; it was at work before June; it was made to intermix cotton threads with elastic threads. The elastic threads were braided first; a man

of the name of Walter Hall first worked this loom. I saw him work day after day with a warp, with the cotton strands intermixed with braided India-rubber strands; that was in June, 1832. I remember the specimen marked K, being made; Walter Hall made it in June, 1832; it was intended for garters. I know there was more than fifty yards made—much more of that web.

Cross-examined by *Mr. Serjeant Wilde.*—Walter Hall had been weaving before Lindsey came into our employ three or four months. Lindsey was a weaver; the web, K, was made by Walter Hall. I know that what was made was sent to the warehouse in Goldsmith-street. That piece was a fag, and it was given to me; it was given to me to make a pair of garters of; I have kept it in a chest of drawers in my own house. Hall continued to work on the same principle at the loom, but not on the same pattern as that (K). I cannot say how much he made besides the fifty or sixty yards; his loom was in a room by itself; we kept our experiments to ourselves. I consider that a new thing; I did not consider it answered, our house had such a demand for the best work that they gave it up; it was of no use to make an inferior article; they began to make again in 1834; Lindsey and Hall worked at the same factory. I should say Lindsey and Hall are much about equal as weavers; I would as soon employ one as the other. We had but three looms at that time, and they were at work upon the best web. I dare say an ordinary weaver might so alter a loom as to try the experiment of making the intermixed web.

Walter Hall sworn. Examined by *Sir F. Pollock.*—I am a weaver; I am in the service of Keene and Co; I first went to them a week after Easter in 1832. I was then employed to superintend the braiding machines till six o'clock in the evening, afterwards I had an opportunity of weaving as long as I liked for over-hours. There was a machine altered in that year; the alteration was to make the piece marked K. It is composed of elastic and

non-elastic; I made it in 1822. I do not know how much I made; I also made some similar—many;—I worked in a room to myself; it was a secret; no one else entered the room but me and Mr. Nickel. The first piece I made was all elastic; I do not know how much I made of the elastic and non-elastic combined.

Cross-examined by *Mr. Attorney General.*—Lindsey did not teach me to weave; I did not know any thing of weaving elastic goods till I went to defendant's; but I was well acquainted with weaving in general. I went twice to the plaintiffs' to seek employment; it was in July, 1833, after I left the service of the defendants; I did not then ask Lindsey to instruct me in weaving. I know a person of the name of Charles Davis by sight, but not otherwise; he was at plaintiff's when I went to ask for employment. I told him I did understand weaving; he told me that plaintiffs would not engage any but weavers: I said I did understand weaving, and did not want teaching. I did understand it, but would have nothing to do with it. I gave Lindsey instructions; I told Lindsey, in August, 1834, or July, 1835, that I had been employed in making goods like K. I made it before Lindsey was engaged by defendant's; he came in November, 1832. I described to him what sort of an article it (K) was, and several others. I was selected on account of my skill, by Messrs. Keene and Co., to make these experiments. I did not try to make the article, K, in the common loom, without the alterations; it might be made in the common loom. I manufactured combined elastic and non-elastic threads into web, in 1833, in January and February; I am now employed in superintending the braiding machines; I like it best.

Re-examined by *Sir F. Pollock.*—Defendants have two factories; I have been at both; on my oath, I made that article, K.

The Foreman of the Jury.—Do you think, my Lord,

we need hear any more evidence with respect to the manufacture of the web on the intermediate principle?

Lord Chief Justice.—That is the point, whether you consider it a new invention by the patentee.

Mr. Attorney General.—I shall call evidence in reply when we have sifted this.

Lord Chief Justice.—We shall see that; at present I think the case is strong.

Sophia Wray Evans sworn.—Examined by *Mr. Creswell.*—I have been in the employ of Messrs. Keene and Co. four years; I was at the factory. I remember Mr. B. Nickel making a loom; I made the harness for it. I helped Walter Hall; it was in September, 1832. Walter Hall used it when it was finished. That piece (K), was made by Walter Hall, in the month of June or July, 1832; it was after I had been employed in making the harness; it was the same year that I made the harness.

Cross-examined by *Mr. Attorney General.*—It was in September, 1832, I helped to make the harness; it was June when the work was made. It was after I helped him to make the harness; it was in September, 1832, I helped to make the harness. Walter Hall came the same year as I did; I came first; I came at coronation time—that was in 1831; now I come to recollect, it was that September when I helped to make the harness.

Joseph Sims sworn.—Examined by *Sir F. Pollock.*—I am a commission agent since 1825, in Wood-street, Cheapside. In 1832, I received some India-rubber web from Mr. Furlow, who was in the employ of Messrs. Keene and Co.; he is since dead; I am sure it was in 1832, in September or October; I should think he brought forty yards; I sold some of it to make garters. I call it combined web; I mean a mixture of cotton with India-rubber warp. There was another piece black, as much as the other; I have no doubt that that put into my hands for sale, by Furlow, was like that marked, K.

Cross-examined by *Mr. Serjeant Stephens.*—When Furlow asked my opinion, I told him it would depend on the price, whether it would sell; my opinion was then that it must be sold at considerably less price; I sold some to Mr. Davis.

Mr. Rees Davis sworn.—Examined by *Mr. Knowles.* —I am a warehouseman. In 1832 I knew Mr. Sims; I bought six different pieces; amongst them was this K. My ledger shows it to be the 10th of October, 1832.

Cross-examined by *Mr. Attorney General.*—I gave that piece to Mrs. Ager to make garters. She was in my employ; it was made into garters; I sold the garters.

Mrs. Ann Ager sworn.—Examined by *Mr. Creswell.*—That article was part of some elastic web given me to be made up into garters by Mr. Davis (the piece was produced); it was in October, 1832. The jury on examining the articles, stated they thought it identical.

Cross-examined by *Mr. Attorney General.*—I have never made up any other web than that made by Keene and Co. I have made up great quantities since for Messrs. Keene and Co.; I do not always keep a pattern. I was not aware till the last day or two that I had kept a pattern of Mr. Davis's, when I was looking for it. I was told the pattern was wanted, and I sought for it. I found it in my son's box; I have found it there on Sunday last; I have seen it there before. I made it up in the month of October, 1832; that I can take my oath of.

Re-examined by *Mr. Creswell.*—I was asked on Saturday to find it, and I searched.

Sir F. Pollock.—That is my case, my Lord.

Walter Hall recalled and examined by *Mr. Attorney General.*—There might be a person of the name of Danston in the employ of Messrs. Keene and Co.; he never taught me any thing about tumblers and counter-meshes; there are such terms in the trade, I have known them for years. There was a person of the name of Pigot, in Mr. Keene's

employment. I do not know that Pigot came from Cornish and Sevier.

Mr. Attorney General.—It is my duty to call important evidence in reply.

Robert Cox sworn.—Examined by *Mr. Attorney General.*—I purchased some goods of Mr. Godby, on 31st of May, 1833, it was called the job lot; I am not aware I ever bought any other. I made the purchase in behalf of Mr. Lee; I am acquainted with the nature of the alternate web. I cannot say any of those were of that quality; what I recollect of them was, that they were of the original quality. The first time I ever saw the alternate was two years ago. I paid the usual price of the market; there was no distinction pointed out by Godby.

Cross-examined by *Sir F. Pollock.*—I did not hear Mr. Godby's evidence. I was sent for between three and four o'clock; I have referred to my ledger for the date. I examined them as braces: I know the difference in the web. I did not examine to see whether they were of alternate web. I say they were not of alternate web. I never saw the article till within these two years; when I was sent for I was asked no questions about the web; all that I came here to answer was, to having purchased of Godby.

Re-examined by *Mr. Attorney General.*—I was well acquainted with the original article; those I purchased of Godby were on the old principle. I have not any doubt about it.

Charles Davis sworn.—Examined by *Mr. Serjeant Wilde.*—I am employed at the plaintiff's factory. I remember Walter Hall coming; he told me he had been used to braid, and he would do nothing else. I told him that we only wanted weavers. He told me he could not weave; he came again; I told him we could not employ him, because he could not weave.

Cross-examined by *Sir F. Pollock.* — Men are paid higher for weaving than braiding; weaving is double. We

could not employ him because he said he knew nothing about weaving.

George Danston sworn. Examined by *Mr. Attorney General.*—I have been in the employment of Messrs. Keene and Co. I know Walter Hall, he applied to me in April, to show him how to enter some small work in a loom; he told me it was going to the trial; it was going to be prepared to take into court, at the trial. I wrote a *tick* on the paper, which he could not understand; a *tick* is the rising of the loom in different ways. I gave him an explanation of it. He asked me what those were at top, I told him the tumblers. I showed him how the parts were worked. From our conversation, I am of opinion he did not understand weaving, that he was as ignorant of it as a child.

Cross-examined by *Sir F. Pollock.*—I came here to prove that Walter Hall is no weaver.

George Lindsey recalled and examined by *Mr. Serjeant Wilde.*—Walter Hall was in the employment of Messrs. Keene and Co.; during the time I was there, he was engaged in the covering department. I should think he did not understand weaving. A short time after I was there Mr. Nickel showed me a loom in a private room, in which was a loom on which work had been attempted to be put on. I am confident no weaver could have attempted to have put it on. The loom was tied up in a very unweaver-like manner; the person who did it could not understand weaving. Hall never told me of having made any such thing. The day after Hall had been at Mr. Sevier's, and had been rejected, he asked me if I could give him sufficient instruction to enable him to satisfy Messrs. Cornish and Co.

Mr. Attorney General.—This is my evidence in reply.

Mr. Cresswell then called the sister of Walter Hall, who swore that her brother had been instructed how to weave, but he never took kindly to it.

Sir F. Pollock replied on the fresh evidence of Mr. Attorney General.

Mr. Attorney General.—May it please your lordship and gentlemen of the jury, I have now the honour of addressing you in reply in this very important case. Gentlemen, monopolies, strictly speaking, in the proper sense of the word, are detestable things, and I am happy to say, they have not existed in this country for a period of 200 years; but how great is the difference between monopoly and giving reward to ingenuity, skill, industry, and perseverance. You will see whether there has been any improvement, and whether that improvement has been made by the person who claims the benefit, and you will rejoice that he should have the reward of his spirit of his perseverance and intelligence. There was an act introduced last session of parliament by Lord Brougham, and is now the law of the land, by which very great benefits are conferred on patentees, and which, if this action had been brought after that law was in operation, would have cut off very much of the effort that has been made to destroy this patent; you are, therefore, gentlemen, without any leaning against a supposed monopoly, I would say you must have a leaning in favour of a patent, but you are to see that the patent is founded on discovery. Your understandings have been opened, and are still open to conviction up to the last moment that your verdict is pronounced; but I venture to ask you now, whether the case that we made out on Monday last was not a case extremely strong, and required a clear and distinct answer? We proved the value of the invention, by a great number of witnesses of undoubted character, and without any interest whatever, and without bias one way or the other, and by various persons in this trade who have an interest, whose interest, if they were not honest men, might lead them to do what they could to destroy the patent, that they might manufacture for their own benefit; their evidence is therefore to be taken with more respect than that of witnesses who come to break down what they call a monopoly. I proved, by a number of witnesses belonging to the trade, that down to 1833 no such manufacture was known. My

learned friend cross-examined for hours together to show there was no essential difference between them, till at last you, gentlemen, saw the difference. You analyzed each number, and you saw that No. 3 was essentially different from No. 1. This manufacture took like wildfire when once it came into the market. The advantages struck all mankind; it beat the others out of the market. Indeed Messrs. Keene themselves said they found they could not go on manufacturing the old article. I, by scientific witnesses, proved the great advantages of this description of manufacture. My learned friend endeavoured by cross-examination to underrate that evidence: he failed—signally failed. There cannot be a doubt that in a few months, probably by means of the publicity of this trial, this article will be so generally known that there will not be an hospital into which this article has not been introduced. My learned friend says, "Let Messrs. Keene and Cornish have it for medical purposes, but let us have it for braces." You see this would just be the wedge; let me get in the corner, and I will soon get in the whole of it; I accomplish my object. It is more plausible to try it in the way of braces than in the shape of medical bandages, because Nos. 1 and 2 have been used in that way. Gentlemen, we have proved the infringement, without question, in October 1834. It was in October they determined that they would set the patent at defiance; and I ask you, when you left the box on Monday night last, was not the impression on your mind, that unless a strong case and a clear answer were given to the case we had made, to find a verdict in our favour? My friend allowed we had made a *primâ facie* case: notwithstanding his flying at every thing, he did not dare to ask his lordship for a nonsuit. He admitted we had made a case that required to be answered. Sir F. Pollock said he would be ashamed to attack the patent through an objection to No. 3, if we succeeded in proving objects 1 and 2. He afterwards again and again tried to pursue

and throw not only prejudice upon object 3, but directly attacked the validity of the patent with regard to the evidence that would be given upon the one and upon the other. Now, gentlemen, this is the manner the defendants have put their defence on record: that defence ought, therefore, to be regarded with the greatest suspicion. When there is a good defence to an action on a patent, a tradesmanlike defence, in the good sense of the word, it is easy to state it—it is easy to prove it; but when a certain combination is made to overturn a patent-right, every chance is to be taken, every advantage is to be pursued without regard to law or justice. Gentlemen, I must do the solicitors of the defendants justice to say, that they have got up their case with great activity and great dexterity; but, gentlemen, when I come to treat of their evidence, I shall show you many instances in which they have tried to impose upon you; and according to the common course pursued by juries, when they find there has been one attempt made to impose upon them, and that attempt has failed, they will criticise the defence that is set up, and from that one they will learn the character of all.

My learned friend laboured for nearly an hour to show that this was not the subject of a patent, because the elastic strands were known before, and because non-elastic were known before—two materials, cotton and India-rubber, and because each have been used separately, that therefore no patent can be taken for a combination of those two articles. That is a proposition which would have made some of the old lawyers turn in their graves if they heard it, because, contrary to the opinions which have prevailed in Westminster Hall for 150 years, you may take a patent for the application of a principle,—you may take a patent for a new substance,—you may take a patent for a new combination of old materials. There must be some thought,—there must be some intellectual merit,—there must be something in the nature

of invention and discovery; but when it is made, people are astonished it has not been sooner thought of. My friend, if his argument were allowed to prevail, would invalidate the most valuable patents that have been taken for the last half century. He would say Watt's steam-engine, with regard to the condensing as a patent, was of no value, because water was known before, and iron was also known before. He might also say Bramah's patent for the hydraulic press was of no value, because the principle of the hydrostatic paradox had been known for a thousand years; but I say it was a new and ingenious application of that principle, and therefore a good patent. It might be said that a patent (if it had been taken) for Sir Humphrey Davy's safety lamp would be of no value, because wire had been known before, and the materials of which it was made were known. In the same manner, gentlemen, you have elastic India rubber known, and non-elastic cotton known, but if you, by a new combination, can make a new manufacture, that is the legitimate object of a patent; there is nothing new in the mechanical powers, but by a new combination of those, if you discover any thing which is beneficial to mankind, for that you are entitled to a patent. My learned friend's witnesses attempted to attack the utility of the invention, and they said, that those articles which were attempted to be manufactured in 1832, were inferior, that the experiments failed, and therefore they abandoned them; not one of them ventured to say that ours was inferior to Nos. 1 and 2, and if it were not superior, why did they buy it. If Nos. 1 and 2 are better than No. 3, for God's sake let them stick to Nos. 1 and 2, and I am glad of it, for then your verdict will do them no harm. What are we here for? They have adopted No. 3, this is the best evidence that can be given of the utility, they give judgment against themselves, and their witnesses, although they had made experiments and failed, they thought that Nos. 1 and 2 were superior. Gentlemen, that is the inconsistency to which men are driven

when they are attempting to do what is wrong; they give evidence against themselves by the very act of piracy. Then the defence is, that this was perfectly well known to the public before the patent, that the defendants themselves had manufactured and sold the article before January, 1833. I must say, that a more improbable story I never heard; but they discontinued it as useless; yet, when the patent was taken, and the article introduced to the market, it took like wildfire; they were driven out of the market by its superiority, and being aware of that, they abstained the making of it during the period of one year and nine months. With submission to his lordship's direction, I will venture to state my view of the law on the subject. If this were publicly known and practised before the date of the patent, my patent is invalid. Gentlemen, it must have been publicly known and in use; a mere experiment is of no avail. If there had been experiments, and had failed and thrown aside, they would not invalidate this patent. The statute of James 1st, upon which all these patents are founded, is thus expressed: that the manufacture shall be such, that "others at the time of making such letters patent shall not use," and it is necessary to keep in mind this statute, and I will call to his lordship's attention some of the late decisions in these matters. In the case of Lewis *v.* Marlin, for shearing cloth, it was proved that a similar machine had been used twenty years before in New York, that a specification was sent over in 1811, to one Thompson, residing at Leeds, to manufacture a machine from it, who employed two engineers to do so, it was never finished, but destroyed by the Luddites; the specification was shown to many persons. In 1816, a model of the machine was brought over from America, by one Smith, and shown to three or four persons in his manufactory. It appeared also, and bear this in mind, that ten years before, one Coxon, had made a machine to shear cloth from list to list, it was tried by a person called by the defendant,

but did not think it answered, and soon discontinued the use. Lord Tenterden observed at the trial, if the invention of shearing from list to list by a rotatory cutter, had not been generally used or known in this country, the patentee might be considered the inventor, within the meaning of the statute of James the 1st. His lordship left to the jury the question (which, with submission, will be the question Lord Chief Justice Tindal will leave to you); whether it had been generally known, and whether the patent had been infringed. The jury found for the plaintiff. Application was made for a new trial, on the grounds of misdirection of the judge. Now Lord Tenterden was a strict judge in respect to patents; but his lordship said, I left it to the jury to say whether it had been in public use before the granting of the patent; they found that it had not. His lordship therefore supported the verdict. Mr. Justice Bailey agreeing with Lord Tenterden, said "It is no objection to my claim to a patent, that another also has made the discovery, provided I first introduce it into public use." Mr. Justice Parke said, "There is no case in which a patentee has been deprived of the benefit of his invention because another had invented it, unless he had brought it into use." And, gentlemen, the verdict of the jury in favour of that patent was confirmed, and remains a valuable patent. There was then the case of Jones *v.* Pearce, tried by Mr. Justice Patterson. The invention was for a wheel, in which the weight was suspended on the circumference of the wheel, instead of its being borne by the nave. It was proved most distinctly that wheels on the same principle had been made and repeatedly used between Belpar and Derby on the public roads, but it was given up, it did not answer; Mr. Strutt having made a wheel-barrow, a strong cart, and a small cart on that principle. In consequence of Mr. Strutt's death the invention was not proceeded with; this was some years before the patent of Jones. There was not any evidence that Jones had

ever heard of or seen the wheels made by Mr. Strutt. Mr. Justice Patterson said, "If on the whole it appears that this wheel constructed by Mr. Strutt, in 1814, was a wheel on the same principle, and substantially the same wheel, and that it was used openly in public, so that every body might see it, and had continued to use the same up to the taking of this patent, undoubtedly then the patent is bad; but if you are of opinion that Mr. Strutt's was an experiment, and that it did not answer, and was abandoned, the plaintiff's which came after, the patent is good."

Therefore, gentlemen, according to the doctrine of these two cases, and according to common sense, an experiment made by persons who have been attempting to make a discovery but have not succeeded, will not vitiate a patent which is afterwards taken. Now bearing these in mind, let us address ourselves to the evidence that has been given, which, I say, is full of suspicion, and shows a powerful combination against this patent. The more cases of previous use the defendants attempt to prove, the more improbable their story is; for I have proved, and fully established, that the invention took like wild-fire in the market: its merits only required to be explained to be understood.

Mr. Attorney-General then contrasted the evidence of the defence, and the discrepancies of the various parties at considerable length, and stated that all had an interest in destroying the patent. The learned gentleman continued:

Gentlemen, I hope you will be of opinion that our case has received no answer, and that we are entitled to your verdict, that the defendants may be permitted to make braces of No. 1; and as they say there is no improvement in No. 3, no injury will be done to them. If there be an improvement in No. 3, then they ought not to participate in the benefit of that improvement, for it is protected by our patent. If you consider no answer has been given, you will come to the conclusion that the

plaintiffs are entitled to your verdict, and thus Cornish and Sevier will receive the reward which is due to them for the ingenuity and skill exhibited in making this discovery.

The Lord Chief Justice Tindal said, it will be my duty, gentlemen of the jury, to endeavour to bring before you as simply as I can the points for your consideration. The patent is dated the 17th of January, 1833, for "an improvement or improvements in the making or manufacturing of elastic goods or fabrics, applicable to various useful purposes;" and it must be substantially made out that such invention has been made. The defendants have raised various issues which you are to decide. In the first place the defendants say they are not guilty of infringement; then that Sevier, at the time of granting the patent was not the true inventor; then that the invention was not a new invention as to the public use and exercise thereof, which I may tell you beforehand will be the principle issue you will have to try; then that it was not an improvement in the making or manufacturing of elastic goods; and, lastly, that there is no sufficient specification. With respect to the first, whether the defendants have infringed, supposing it to be a good patent; that depends on several of the witnesses who purchased—

Mr. Creswell.—I will not trouble your lordship to put that question.

The Lord Chief Justice.—This, then, may be dismissed from your mind. There was no evidence to show the specification was insufficient; scientific men, and men of humble station, proved the possibility of making without other aid than that derived from the specification. Gentlemen, the remaining questions which I shall call your attention to, is whether a manufacture of the same kind was in general use, and whether the invention was or was not an improvement, and invented by the patentee. Upon these there is certainly contradictory evidence. You will however have

to say from the evidence, whether that called No. 3 is or is not an improvement. Now was No. 3, which varies in the mode of obtaining its object from either No. 1, which was entirely composed of elastic materials, or from No. 2, which confined the elastic materials in a kind of sheath—was this an improvement? The patent is taken for three objects; with respect to the first, little evidence has been given, and such is the case with the second. In fact, although it is necessary to leave these to you, it is impossible not to see that the great battle between these parties had turned on the third object of the patent. Now, gentlemen, it was with reference to the third object that I stated the evidence on each side was contradictory, and you must therefore draw the balance between the parties. (Here his Lordship read the evidence of the plaintiff's witnesses, commenting on the same, pointing out the utility of the invention, and contrasting the same with the evidence of the defendants.) His Lordship then said No. 3 article is one, which according to the testimony of plaintiffs' witnesses, as well as some of the others, has had an extensive sale, we are at liberty to ask ourselves how it obtained that, for though the greater cheapness would go a good way to account for it, it will not go the whole way. One question you have to determine, is, whether this article was an improvement in the manufacture. We now come to the question whether Sevier was the first inventor; whether it was known and practised in England before the obtaining of the patent. This question resolves itself into two; they say, that the invention was not a new invention as to the public use and exercise thereof; they go on to say, that Mr. Sevier was not the first inventor. I do not know whether the second question will become very material if you dispose of the first, because, if the defendants establish, for instance, that it was something known and practised in England generally, at the time of the patent, it is useless to go any

further. On the other hand, if you decide that this was a new discovery, the patent is a good one, that is, that it was not practised and known in the kingdom at the time; there is no evidence to deprive Mr. Sievier of the merit of being the inventor; if it had been proved that he had borrowed it from A, or B, or took it from a book printed in England, and which was open to all the world, this would have been an end to the case. Now, gentlemen, was it or was it not, in the language of the Act of Parliament, an invention at the time of making such letters patent. If this No. 3, was, at the time of granting these letters patent, in any degree of general use, known to the world publicly, and practised openly, that any other person might have the means of acquiring the knowledge of it, then the patent would be void. It will be for you to say, whether, upon the evidence, the invention was or was not in public use and operation at the time the patent was granted. It is obvious that there are certain limits to this question; a man may make experiments in his own closet, if he never communicates these experiments to the world, and lays them by, and another person has made the same experiments, and being satisfied, takes a patent, it would be no answer to say that another person had made the same experiments; there may be several rivals starting at the same time. The first who comes and takes a patent, it not being generally known to the public, that man has a right to clothe himself with the authority of the patent, and enjoy the benefits of it. If the evidence, when properly considered, classes itself under the description of experiment only, that would be no answer; on the other hand, the use of an article might be so general as to be almost universal; then you can hardly suppose any body would take out a patent. That in effect would be to create a monopoly in this article, without giving either benefit to the world of a new discovery, or the personal right to the value of the patent. Therefore, it must be

between these two limits (if I may so call them) that most cases will range themselves, and it must be for the jury to say whether the evidence brought before them convinces their understanding that the subject of the patent was in public use and operation at the time when the patent was granted. If it was in public use and operation then the patent is void. If it was not, the patent stands good. You will have to apply your understanding to-day to the evidence in the case, which is, in many parts of it, contradictory, in order to say whether you bring the case within one of those descriptions, and whether this patent is or is not for a new invention [here his lordship stated the nature of the plaintiff's evidence on the point of novelty; his lordship then stated, at some length, the evidence of the defendants. The foreman of the jury said that they were fully in possession of the facts of the evidence, and only wished to have their attention drawn to particular points which had borne on his lordship's mind]. His lordship continued. Then, gentlemen, I shall not take up your time unnecessarily. You must first say whether thedefendants' have infringed,—that I suppose there is no doubt about,—then you must say, whether there is a sufficient description of the nature of the invention. I introduce these first, that you may dismiss them from your consideration;—then you must say, whether it is an improvement; then come the two important issues: was Sievier the first inventor; then the main question, was the invention, at the time the patent was granted, a new invention as to the public use and exercise thereof; I would only observe, that it must not be such a practice as is only referable to mere experiment, but it must be, in order to set the patent aside, a question whether it was in public use and operation amongst persons in their trade and likely to know it. If you find it was so, you will find your verdict for the defendants. If you are not satisfied of that and think the case made by the

defendants not proved to your understanding, that there was a public use and exercise of the invention, then you will find your verdict for the plaintiffs.

The jury, after being absent twenty minutes, returned a verdict for the plaintiffs.

NOTICE OF EXPIRED PATENTS.

(*Continued from p.* 194.)

Samuel Brierley, of Salford, Manchester, Lancashire, Dyer, for an improved method of preparing raw silk, and cleansing the same, for the purpose of dyeing and manufacturing.—Sealed December 19, 1821.

John Gladstone, of Castle Douglas, in the stewartry of Kircudbright, and county of Galloway, North Britain, Engineer and Millwright; for an improvement or improvements in the construction of steam vessels, and mode of propelling such vessels, by the application of steam or other powers.—Sealed December 20, 1821.

Julius Griffith, of Brompton Crescent, Middlesex, Esquire, for certain improvements in steam-carriages; and which steam-carriages are capable of transporting merchandise of all kinds, as well as passengers, upon common roads, without the aid of horses. Partly communicated by foreigners residing abroad.—Sealed December 20, 1821.

PATENTS GRANTED FOR SCOTLAND,

From 7th July to 10th September, 1836.

David Fisher, of Wolverhampton, in the county of Stafford, Mechanic, for an improvement in steam-engines.—Sealed July 7, 1836.

Hamer Stansfeld, of Leeds, in the county of York, Merchant, for improvements in machinery for preparing certain threads or yarns, and for weaving certain fabrics. Communicated by a foreigner residing abroad.—Sealed July 8, 1836.

Thomas Rock Shute, of Watford, in the county of Hertford, Silk Throwster, for improvements in spinning and doubling organzine silk.—Sealed July 8, 1836.

Robert Walter Swinburne, of South Shields, in

the county of Durham, Agent, for certain improvements in the manufacture of plate glass.—Sealed July 12, 1836.

Edward Jelowicki, of No. 8, Seymour Place, Bryanstone Square, in the county of Middlesex, Esq., for certain improvements in steam-engines. Communicated by a foreigner residing abroad.—Sealed July 15, 1836.

Benjamin Simmons, of Winchester Street, in the borough of Southwark, and county of Surrey, Engineer, for certain improvements in chemical retorts, stills, and other apparatus, and in the machinery connected therewith, and by the use or employment whereof various processes can be speedily, conveniently, and economically performed.—Sealed July 18, 1836.

John Isaac Hawkins, of Chase Cottage, Pancras Vale, in the Hampstead Road, in the county of Middlesex, Engineer, for an improvement in the art of manufacturing iron and steel. Communicated by a foreigner residing abroad.—Sealed July 18, 1836.

John Archibald, of the parish of Alva, in the county of Stirling, and kingdom of Scotland, Manufacturer, for certain improvements in machinery, or apparatus for carding wool, and doffing, straightening, piecing, roving, and drawing rolls or cardings of wool.—Sealed July 21, 1836.

William Wainwright Potts, of Burslem, in the county of Stafford, China and Earthenware Manufacturer, William Machin, of Burslem aforesaid, China and Earthenware Manufacturer, and William Bourne, of Burslem aforesaid, Manager, for an improved method or process, whereby impressions or patterns in one or more colours or metallic preparations are produced and transferred to surfaces of metal, wood, cloth, paper, papier machée, bone, slate, marble, and other suitable substances prepared, or otherwise not being used or known, as earthenware, porcelain, china, glass, or other similar substances.—Sealed July 29, 1836.

Walter Hancock, of Stratford, in the county of

Essex, Engineer, for an improvement or improvements upon steam-engines.—Sealed July 29, 1836.

John M'Dowall, of Johnstone, in the county of Renfrew, Scotland, Engineer, for certain improvements in machinery for sawing and cutting, and likewise in the mode of applying motive power thereto.—Sealed August 2, 1836.

Henry Walker Wood, of No. 29, Austin Friars, in the city of London, Merchant, for certain improvements in certain locomotive apparatus.—Sealed August 4, 1836.

John Burns Smith, of Salford in the county of Lancaster, Spinner, and John Smith, of Halifax, in the county of York, Dyer, for a certain method or methods of tentering, stretching, or keeping out cloth to its width, made either of cotton, silk, wool, or any other fibrous substances by machinery.—Sealed August 11, 1836.

Henry Gore, of Manchester, Machine Maker, for certain improvements in the machinery or apparatus for spinning or twisting cotton and other fibrous substances.—Sealed August 11, 1836.

Samuel Hall, of Basford, in the county of Nottingham, Gentleman, for improvements in propelling vessels, also improvements in steam-engines, and in the method or methods of working some parts thereof, some of which improvements are applicable to other useful purposes.—Sealed August 15, 1836.

Thomas Earl of Dundonald, of Regent's Park, in the county of Middlesex, for improvements in machinery and apparatus applicable to purposes of locomotion.—Sealed August 15, 1836.

Joshua Bates, of Bishopsgate Street, in the city of London, Merchant, for certain improvements in machinery for cleaning and preparing wool. Communicated by a foreigner residing abroad.—Sealed August 19, 1836.

John Sharp, of the burgh of Dundee, in the county of Forfar, in North Britain, Flax Spinner, for certain ma-

chinery for converting ropes into tow, and certain improvements in preparing hemp or flax for spinning; also certain improvements in certain machinery for the preparation thereof for spinning; part of which improvements are also applicable to the preparing of cotton, wool, and silk, for spinning.—Sealed August 24, 1836.

James Champion, of Manchester, in the county of Lancaster, Machine Maker, for certain improvements in machinery for spinning, twisting, and doubling cotton and other fibrous substances.—Sealed August 31, 1836

John Springall, of Oulton, in the county of Suffolk, Iron Founder, for an improved mode of manufacturing certain parts of ploughs.—Sealed September 2, 1836.

Richard Thomas Beck, of the parish of Little Stonham, in the county of Suffolk, Gentleman, for a new or improved apparatus, or mechanism, for obtaining power and motion to be used as a mechanical agent generally, which he intends to denominate Rotæ Vivæ. Communicated by a foreigner residing abroad.—Sealed September 10, 1836.

Henry Scott, Junior, and Robert Stephen Oliver, Hatters, in the city of Edinburgh, for a certain improvement or improvements in the manufacture of hats, caps, and bonnets. Communicated by a foreigner residing abroad.—Sealed September 10, 1836.

LIST OF NEW PATENTS.

Robert Griffiths, of Birmingham, in the county of Warwick, Machine Maker, and John Gold, of the same place, Glass Cutter, for certain improvements in machinery for grinding, smoothing, and polishing plate glass, window glass, marble, slate, and stone, and also glass vessels, and glass spangles and drops.—Sealed September 1, 1836.—(*Six months.*)

John Pickersgill, of Coleman Street, in the city of

London, Merchant, for improvements in preparing, and in applying India-rubber (caoutchouc) to fabrics. Communicated by a foreigner residing abroad.—Sealed September 1, 1836.—(*Six months.*)

James Surrey, of York House, in the parish of Battersea, in the county of Surrey, Miller, for a new application of a principle by which mechanical power may be obtained or applied.—Sealed September 1, 1836.—(*Four months.*)

William Bush, of Wormwood Street, Bishopsgate Within, in the city of London, Surveyor and Engineer, for improvements in the means of, and in the apparatus for, building and working under water, part of which improvements are applicable for other purposes.—Sealed September 3, 1836.—(*Six months.*)

Charles Farina, of No. 7, Clarendon Place, Maida Vale, in the county of Middlesex, Gentleman, for an improved mashing apparatus.—Sealed September 15, 1836. —(*Six months.*)

William Hinkes Cox, of Bedminster, near Bristol, Tanner, for an improvement or improvements in tanning hides and skins.—Sealed September 15, 1836.—(*Six months.*)

John Frederick William Hempel, of Oranienburg, in the kingdom of Prussia, but now of Clapham, in the county of Surrey, Officer of Engineers, and Henry Blundell, of Hull, in the county of York, Paint and Colour Manufacturer, for an improved method of operating upon certain vegetable and animal substances in the process of manufacturing candles therefrom. Communicated by Frederick Hempel, of Oranienburg, aforesaid, deceased. —Sealed September 15, 1836.—(*Six months.*)

Joshua Bates, of Bishopsgate Street, in the city of London, Merchant, for improved apparatus or machinery for making metal hinges. Communicated by a foreigner residing abroad. — Sealed September 15, 1836. — (*Six months.*)

Peter Ascanius Tealdi, formerly of Mendovi, in

Piedmont, but now residing in Manchester, in the county of Lancaster, Merchant, for a new extract or vegetable acid obtained from substances not hitherto used for that purpose, which may be employed in various processes of manufacture, and in culinary or other useful purposes, together with the process of obtaining the same. Communicated by a foreigner residing abroad.—Sealed September 15, 1836.—(*Six months.*)

William Bates, of Leicester, Fuller and Dresser, for improvements in the manufacture of reels for reeling cotton.—Sealed September 16, 1836.—(*Six months.*)

Moses Poole, of Lincoln's Inn, in the county of Middlesex, Gentleman, for improvements in the description of public vehicles called cabs. Communicated by a foreigner residing abroad.—Sealed September 21, 1836.—(*Six months.*)

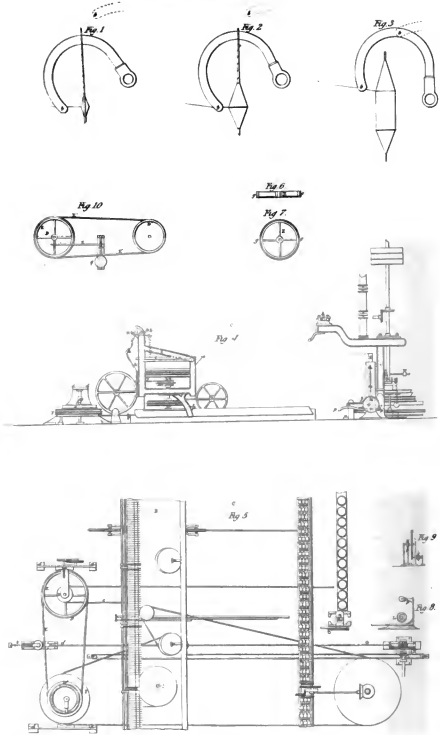
William Crofts, of Radford, in the county of Nottingham, Machine Maker, for certain improvements in machinery for making bobbin-net lace, also called twist net or lace, part of which improvements are for the purpose of making figured or ornamented bobbin-net lace, or figured or ornamented twist lace.—Sealed September 22, 1836.—(*Six months.*)

Robert Jupe, of New Bond Street, in the county of Middlesex, Cabinet Maker, for improvements in apparatus applicable to book and other shelves.—Sealed September 22, 1836.—(*Six Months.*)

Henry Van Wart, of Birmingham, in the county of Warwick, Gentleman, and Samuel Aspinall Goddard, of the same place, Merchant, for certain improvements in locomotive steam-engines and carriages, parts of which improvements are applicable to ordinary steam-engines, and to other purposes.—Sealed September 22, 1836.—(*Six months.*)

John Smith, of Halifax, in the county of York, Dyer, for certain improvements in machinery for dressing worsted and other woven fabrics.—Sealed September 22, 1836.—(*Six months.*)

Ashworth & Greenough's Patent.



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F. Mansell, fc.

THE

REPERTORY

OF

PATENT INVENTIONS.

No. XXXV. NEW SERIES.—NOVEMBER, 1836.

Specification of the Patent granted to Edmund Ashworth, *of Egerton, in the County of Lancaster, Cotton Spinner, and* James Greenough, *of the same place, Overlooker, for certain Improvements in the Machinery used for Preparing and Spinning Cotton, Silk, and other fibrous Materials.*—Sealed February 5, 1836.

WITH AN ENGRAVING.

To all to whom these presents shall come, &c. &c.,—*Now know ye*, that in compliance with the said proviso, we, the said Edmund Ashworth and James Greenough, do hereby declare the nature of our said invention to consist of the addition and adaptation of certain apparatus or machinery to the preparation machine known by the name of the stretcher, and also to the spinning machine called the mule, for the purpose of rendering such machines more effectually self-acting, or independent of the operative or superintendent of such machines. And that this may be better understood we shall, in the first place, briefly describe the movements required in the machine called the mule. These movements may be divided into

five (exclusive of the motion of the drawing rollers and the rotation or spinning action of the spindles), namely, the coming out of the carriage during the spinning, the backing off or unwinding the spiral coils of yarn which accumulate on the spindles during the spinning process, the putting down and guiding the faller as the carriage proceeds in or towards the front roller, the putting up the carriage, and the winding on or distributing the yarn on the spindles in the form of a cop while the carriage is putting up. To this last mentioned movement, called the winding on, one of our improvements is applied, and we shall therefore proceed to explain the nature of this movement before we describe our improvement applied thereto. The stretch or distance which the carriage proceeds from the front roller of the mule being uniformly the same, the length of yarn to be wound on the spindle will also be uniformly the same at each going up of the carriage. To wind on or dispose of this length or stretch of yarn a varying number of revolutions of the spindles will be required, for it is obvious that the same number of revolutions required to wind on on the bare spindle, will not be required when the cop has increased in diameter by the accumulation of yarn on its surface, and also that the velocity of the spindles must vary as the position of the faller-wire guides the yarn on to the various diameters of the cop during the winding on; and it is to effect this accommodating motion or winding on to the spindles that we apply certain apparatus, hereinafter described, in which one part of our improvements consists. The remaining part of our improvements consists in the addition and application of further apparatus for the purpose of regulating the rise of the upper faller-wire when the carriage arrives up at the front roller. But before we proceed to describe the nature of this part of our improvements, we shall also explain its necessity and importance; supposing therefore the winding on of any stretch of yarn to be completed, and the carriage to be up at the front

rollers, it is required to raise the upper faller to allow the spinning to proceed in the succeeding stretch, and on the exact period of time at which such rise of the upper faller takes place greatly depends the occurrence of what is called snarls or spiral twistings of the yarn, which it is the object of every spinner to avoid. In the building, as it is called, of a cop, the position of each spiral layer is governed by the upper faller, until it arrives at the apex of the cone which is the bare spindle. The upper faller-wire arrives at the point or apex at the same time that the carriage arrives at or near the front roller, and it is then required to be raised clear of the spindle for the spinning to recommence. But, supposing this raising of the upper faller-wire to commence uniformly at the same period of time as the carriage arrives at the front roller, it is clear that when the cop is complete, the upper faller-wire will be clear of the spindle sooner than when the cop commences, inasmuch as the arc performed by the faller in the latter case exceeds the arc in the former case. Now, although this difference of the period of time at which the faller clears the spindle for the spinning to recommence is not found to be of very essential importance in low or course numbers of yarn, or in such as require but little twist, yet in finer numbers, or in such qualities as require a greater amount of twist, the early period at which the upper faller is clear of the spindle, towards the completion of the cop is found to cause those snarles or spiral twistings of the yarn, which it is the object of one part of our improvement to obviate, and the nature of which part of our improvement is to cause the faller to rise at different periods according as the cop is more or less formed.

Having described the nature of the movements to which our improvements apply in the stretcher and mule, we shall, in further compliance with the said proviso, proceed to describe in reference to the annexed drawing and to the figures and letters marked thereon, the manner in

which the same are to be performed and carried into effect; and in the said description the mule only will be spoken of, as the stretcher resembles it in every respect, the distinction being that the mule is speeded to produce a perfect yarn or thread, while the stretcher is speeded to put in less twist and merely elongate, in order to reduce the roving to the required fineness.

Description of the Drawing.

Fig. 1, represents a mule-spindle at full size with the commencing of a cop placed on it.

Fig. 2, represents a spindle with the cop arrived at that period commonly called the cop bottom. And

Fig. 3, represents a spindle with a complete cop, in the form in which it may be taken from the machine and its operation recommenced.

Fig. 4, represents a transverse section of a mule to which our improvements are applied. And

Fig. 5, a plan of the same. The remaining figures are detached parts to be hereafter referred to. In figs. 4 and 5, A, represents the drawing toller. B, the carriage; and C, the stretch or length of thread or yarn spun during any one stretch or coming out of the carriage. These and other parts are delineated for the purpose of shewing the position in which our improvements are applied, but, as already stated, being no part of our invention, require no particular description. We shall now proceed to describe the movement by which the winding-on is effected. In figs. 4 and 5, *d*, *d*, represents a frame attached to the floor for the purpose of supporting the axis of the pulleys, D and D^1, the former of which carries a band, *e*, attached to the carriage, B, so that when the carriage is proceeding in towards the front rollers, the pulley, D, is revolved in the direction indicated by the arrows on its periphery. On the same shaft which carries the pulley, D, is placed the pulley, E, carrying the strap, E^1, which conveys motion to the pulley, D^1, placed free on a shaft, on which the

drum-band pulley, F, is firmly attached. This pulley, D^1, which is driven by the strap, E^1, the motion of which emanates from the going in of the carriage, is occasionally connected with the shaft, on which it is placed, by means of a dog or catch, *f*, as seen at fig. 4, which represents an elevation of this part, as seen from the side. Now supposing the putting up of the carriage to have commenced, the band, *e*, will revolve the pulley, D, the motion of which, being conveyed by the strap, E^1, the drum-band pulley, F, revolves the spindles and winds on, in the manner described in Messrs. Dobson, Threlfall, and Sutcliffe's specification of their patent for certain improvements in machinery for roving and spinning cotton and other fibrous materials, dated February 6, 1834. But the varying speed required for the varying circumference would not be produced by any positive or uniform motion, and this required variation is effected by allowing the strap, E^1, to slip, similar to the arrangement patented by Maurice de Jongh, and set forth in the specification to his patent for an improvement or improvements in spinning and preparation machines, generally called mules, fennies, slubbers, or any other machine to which this invention may be applied, bearing date March 29, 1825. The tension of strap, E, is adjusted not to exceed the required force for winding on the bare spindle; and this tension of the strap, E^1, is made available to the variable velocity imparted by means of a slipping collar or hoop, *g*, placed between it and the driving pulley, D, as seen in section and plan at figs. 6 and 7, where similar letters represent similar parts, as already stated; and *g*, represents the slipping collar. The uniformity and smoothness of this slipping collar over the slipping of an irregular strap, will be obvious to all persons conversant with machinery of this nature, and in practice, we find, that a given tension of the strap, E^1, combined with the slipping action of the collar, *g*, enables us to wind on with greater delicacy, and, consequently, spin finer numbers, or qualities,

of yarns than heretofore spun on self-acting machinery. But the varying speed required, as already explained, on the various parts of the cop to which the faller-wire guides the thread at each going in of the carriage, is effected by varying the tension, by the following means. In fig. 5, L, represents the scroll by which the carriage is brought in during each successive winding on, which scroll receives motion, when required from the ordinary arrangement of apparatus in machines of this nature. On the same shaft as the scroll, L, is placed a pinion which geers into the spur-wheel, M, which is so calculated that the wheel, M, shall make one full revolution during each coming in of the carriage, B. N, represents an eccentric or cam-piece of a peculiar form, as best seen at fig. 8, placed on the same shaft as the wheel, M, and partaking of the same rotation. The revolution of this cam or eccentric, N, actuates or governs the traverse of the rod, O, which is held in contact with it at the point, *p*, by means of a small spiral spring, *s*, at the opposite extremity, as seen in plan at fig. 5. The rod, O, is supported on the floor by guides, and is provided with a small friction-pulley, *q*, which presses more or less against the strap, E, according to the varying position of the eccentric, N, which governs the position of the rod, O, on which it is placed. Thus according to the form of the eccentric, N, when the carriage, B, is out, or at the greatest distance from the front roller, the pressure is greatest, and the greatest force is exerted to start the spindles and commence winding on, but as the carriage proceeds in, the force is diminished by the varied position of the eccentric, and when the carriage arrives at or near the front roller, the force and consequent velocity imparted to the spindles is again caused as at starting, until the winding on ceases; and the form of the eccentric, represented at figs. 8 and 9, is one which we have found to produce the varying speed required. Another means of effecting this varying speed required for the winding on, is delineated and shewn at

fig. 10, in which D, represents the pulley which imparts motion to the strap, E^1, as already described. On the shaft which carries the pulley, D, is placed a worm or screw taking into a worm-wheel placed on the horizontal shaft, *t*, on the opposite end of which is placed a spur-pinion geering into the rack, T, placed on the floor and moving freely in a guide or slot. This rack, T, is also provided with a tightening pulley, *q*, and the speed of the pinion which governs its traverse is so calculated as to tighten the strap, E^1, at the commencement of the going in of the carriage, and relieve it as the carriage approaches the front rollers. This latter movement, described and set forth at fig. 10, although it does not tighten the strap, E^1, when the carriage is up at the front rollers (as in the former movement, described at fig. 5), is, nevertheless, more compact, and found to answer in practice.

Our next improvement, which consists in varying the rise of the upper faller according to the progress which the cop has made towards its completion, as already described, is performed and carried into effect as follows: In fig. 4, H, represents the shaft on which the small levers which carry the upper faller-wire, vibrates as a fulcrum, and *h*, is the extremity at which the faller-wire is held or supported. h^1, h^1, represent a kneed or jointed shaft, which allows the upper faller-wire to rise clear of the spindle when bent, and when forced into a straight position depresses the upper faller wire to the base of the conical layer then winding on as shewn in red lines, *b*, *b*, figs. 1 and 3. The lower extremity of this jointed rod, h^1, h^1, is provided with a small roller which, during the putting up of the carriage, passes along an inclined plane or shaper, and thereby regulates the rise of the upper faller during the winding on, in the same manner as already applied to various self-acting mules. But as soon as the carriage arrives at or near the front rollers, the horizontal rod, *i*, *i*, strikes against the stop, K, which bending the jointed rod, h^1, h^1, elevates the upper faller

clear of the spindle as required for the recommencement of the spinning process; referring to the part or stop, K, fig. 4, it will be remarked that the point or stop, K, with which the rod, *i*, comes in contact, is supported and governed in its position by the perpendicular screw, *m*, *m*, the lower extremity of which is provided with a small bevil-wheel, *n*, geering into the bevel-wheel, o^1, on the shaft of which is placed a ratchet-wheel, o^2; into this latter ratchet-wheel, o^2, a small dog or catch takes, which is connected with the horizontal lever, p^1, p^1, which lever is depressed at every putting up of the carriage, B, by the small roller, p^2, thereby gathering a tooth or more in the ratchet, o^2, and revolving the screw, *m*, *m*. This revolution of the screw, *m*, *m*, necessarily depresses the part, K, and thereby prevents the notched extremity of the rod, *i*, arriving in contact at so early a period as when it is at any higher elevation. By tracing the dotted lines from the stepped or notched extremity of the rod, *i*, the progressively increasing delay in its arrival at the part or stop, K, which causes the final rise of the upper faller-wire clear of the spindles, will be obvious, and the consequently increasing delay of the rise of the upper faller as the cop increases in size effected, and thus the occurrence of snarls or spiral twistings of the yarn will be prevented. Now although we have in the foregoing specification and drawings described and delineated many well known parts of the ordinary machine, called the mule, together with some parts of other machinery already patented, for the purpose of making the construction and application of our improvements better understood, we do not claim as our invention any such well known parts, or parts of machinery already patented. But what we do claim as of our invention is, firstly, the application and adaptation of the slipping or moving collar hereinbefore referred to by the letter, *g*, for the purpose of rendering the force imparted by the strap, E^1, more uniform, the amount of such force being modified or varied by means

of the eccentric as described at fig. 5, or the other means described at fig. 10, for tightening or slackening the strap, E^1, which combination of parts being new, and never before conjointly used for the purpose of winding on as hereinbefore described, we claim as one of our said improvements. And, secondly, we claim as our invention, and as another of our said improvements, the varying the period at which the final rise of the upper faller wire commences at the termination of the winding-on movement for the purpose of clearing the spindles, preparatory to the recommencement of spinning, in such manner that in proportion as the cop increases in size at each putting up of the machine, so is the rise of the upper faller wire for the purpose aforesaid, delayed, and the occurrence of snarls almost entirely prevented. And although we have only described one mode of effecting this variation in the time at which the upper faller wire is to begin to rise at the end of the winding-on movement, or when the carriage is at or near the front rollers, yet it is obvious that the means by which this rise is effected may be modified and varied as well as the relative varying periods at which each successive rise of the upper faller wire shall take place, but we claim as our invention the application of machinery by which the final rise of the upper faller wire may be governed and controlled according to the progressive building of the cop as hereinbefore described, and such improvements as aforesaid being, to the best of our knowledge and belief, new and never before practised as applied to self acting mules and stretchers, we do hereby claim exclusive right and privilege to the same.—In witness whereof, &c.

Enrolled August 5, 1836.

Specification of the Patent granted to John Brunton, *of West Bromwich, in the County of Stafford, Engineer, for Certain Improvements in the Construction of Retorts for Generating Gas for the purpose of Illumination.*—Sealed March 25, 1835.

WITH AN ENGRAVING.

To all to whom these presents shall come, &c. &c.—*Now know ye,* that in compliance with the said proviso, I, the said John Brunton, do hereby declare that my said invention consists in the methods by which the coal is introduced into, and propelled through, the retort, and in the method by which the coke is expelled or discharged from the retort without interruption to the process of carbonization; and by the application of which methods, as hereinafter more particularly described, the retort is maintained in an uniform state of fulness (or nearly so), and the coal introduced and the coke discharged without exposing the interior surface of the retort to atmospheric air, or in any material degree suspending the process of generating gas.

Having thus briefly stated the nature of my improvements, I proceed to describe by means of the accompanying drawings, their construction and arrangements; first premising that the letters in the several figures correspond with each other, and are intended to indicate corresponding parts of the apparatus.

Description of the Drawing.

Fig. 1, of the drawings hereunto annexed is a section of a retort with the various parts attached, and constructed according to my improved plan.

Fig. 2, is a front view of the feeder mouth-piece without the front cover, and shews the interior of the hollow piston and the case in which it is worked.

Fig. 3, is a front view of the feeder mouth-piece, in

which the piston is worked by a rack and pinion instead of a screw as in fig. 2.

Fig. 4, is a section of fig. 3, shewing the mode in which the rack and pinion are applied.

Fig. 5, is a front view of a bench of retorts, in which there appear three fixed over one furnace, the middle retort is represented as having the top cover or lid raised, and shews the plan of the hinges as well as the lip round the outer edge of the lid which falls into the narrow trough of loam or fine sand, or other suitable material, by which the joint is made tight.

Fig. 6, is an end view of the same bench of three retorts, exhibiting the exit pipe through which the gas passes to the hydraulic main, the discharge cylinder or shoot through which the coke falls into the cistern or reservoir of water, and the mode of fixing them to the end-piece of the retort.

A, fig. 1, is a section of a feeder through which the coal or other material is introduced into the retort in the manner hereinafter described; *f*, is the cover or lid having a lip to fall into a cavity or narrow trough, *b*, *b*, surrounding the top of the feeder, A, which trough is intended to contain fine loam or sand, or any other suitable material by which the joint may be made tight. The lid is fitted with strong hinges as seen at, *g*, *g*, in the top part of the middle retort feeder in fig. 5. *n*, is a diaphragm of sheet iron or other suitable material fitted to the interior of the feeder, A, and attached to a spindle, *o*. This spindle passes through the side of the feeder, A, being fitted and ground so as to prevent the escape of gas. To the outer end of the spindle is affixed a handle *h*, as seen in figs. 2 and 3, whereby the diaphragm, *n*, is made to close and divide the feeder when required. *i*, is a spring catch for keeping the feeder divided when a fresh supply of coals is required; the space above the diaphragm may at the same time form a measure of the quantity of coals newly introduced.

B, shews the forcing apparatus by means of which the coals or other materials are propelled through, and the coke is expelled from, the interior of the retort. *a, a,* is a longitudinal section of a piston, of which the transverse section is shewn at, *a, a,* fig. 2, having a cross bar secured to it by screws and a hole in the middle, in which is a nut or female screw to receive the screwed spindle, *a,* and by which the piston, *a, a,* is forced forward when required in propelling the coals and the coke through the retort. The screwed spindle, *d,* has a collar fitted to the bottom of the stuffing box in the cover of the piston case at, *c,* and the said spindle is retained in its place, by a loose collar of brass fixed by screws, as seen at, *e, e.* The outer end of the spindle is fitted with a gland, and is held down by screws and packed with hemp and tallow, or other suitable material usually employed for the purpose of preventing the escape of gas in other machinery of a like nature. To the end of the spindle is fixed a handle for turning the same; the lid or cover, *c,* is secured to the end of the piston case by screws, as shewn at, *c,* fig. 5, and jointed with paste board or other suitable material in the usual way.

C, is a section of a retort which is made taper for the purpose of facilitating the passage of the materials with which the retort is charged to the wider end, it is fixed to the mouth piece or feeder at, *r, r,* in the customary manner with bolts and screws, cement, &c., the length and diameter of the retort may be varied or its shape altered according to circumstances.

D, is a section of the end piece of the retort with the discharging cylinder or shoot, F, through which the coke falls or is discharged into a cistern of water, E, and which end piece is secured to the retort by screws, and jointed with cement at, *s, s;* an end view of the same is shewn in fig. 6. The discharging cylinder or shoot, F, dips into the water so deep as effectually to prevent the escape of gas.

The exit pipe, G, through which the gas is conveyed to the hydraulic main is made in the usual form. The cylinder or shoot, F, through which the coke is discharged into the cistern, E, should be made the full width of the inside of the retort, so that no obstruction may arise to the clear discharge of the coke or other material. The end piece of the retort is also supplied with a small lid or cover, which is secured by a cross bar and screw as described at, H, and which may be taken off at any convenient time for the purpose of examining the interior of the retort.

Having given a description of the several parts of my improved retort, I now proceed to describe the mode of charging and working the same. The charges both as to time and quantity must be regulated by the capacity of the retort and the quality of the coal or other material used. Having myself been in the habit of using Staffordshire coal, I have found it most convenient to charge a retort of about four and a half feet long, and about twelve inches diameter at the small end, and eighteen inches diameter at the other end, every hour, with about eighteen or twenty pounds weight of coal, after the following manner:—the diaphragm, *n*, being shut and kept close by the spring catch, *i*, the lid or cover, *f*, of the feeder, A, is raised, and the requisite quantity of coals introduced upon the diaphragm, *n*, when the lid, *f*, is closed or shut. The coal remains in this position until the previous charge has been forced into the retort by the piston, as already described, and when the piston has been again drawn back, the diaphragm, *n*, is let down, and the fresh charge occupies the space between the retort and the piston, thereby keeping the heat from extending to the apparatus, as well as being ready to be forced forward into the retort when another charge shall be required. It may be here observed that it is not necessary that manual labour should be employed in forcing the charges into the retort; for, where there is steam or other power,

by the application of a ratchet-wheel fixed on the end of the screwed spindle, *d*, worked by a small catch and lever acted upon by an eccentric wheel upon the revolving shaft from the steam or other power-engine, it may be so timed as to complete the process in any given period, with the greatest precision and a material reduction of labour. It will be obvious that whenever a certain quantity of coal is introduced into the retort by means of the piston, *a*, *a*, an equal bulk of coke will be discharged into the water cistern, E, through the cylinder or shoot, F, and may be removed from thence by means of a basket or other receiver placed within the cistern under the discharging shoot, F, or by being raked into a barrow placed at the end of the cistern, or, still keeping in view the economy of manual labour, the coke may be readily removed by an endless chain worked by a steam-engine or other power emptying it into a barrow at the end of a range of retorts.

I have thus described my improvements in the construction of retorts for generating gas for the purpose of illumination. I have represented in fig. 1, of the drawings annexed, a retort set in the ordinary position, though not exactly in the ordinary shape. It is described as open at both ends, the coal being introduced at one end and the coke discharged at the other; to this I lay no claim, nor do I confine myself to the precise modification of the various parts of the retort, as already described in the figures hereunto annexed, nor to the materials of which they may be formed, but I have shewn that which I consider the best arrangement for a coal gas retort, and which I have found practically to answer.

What I claim as my invention is the arrangements and combination of the various parts of the retort by which the coal is introduced into, and afterwards propelled through, the retort, and the coke discharged from it; by which means the retort is kept in an uniform state of fulness, introducing and discharging simultaneously bulk

for bulk of coal into and coke out of it into a cistern of water, without exposing the interior of the retort to the cooling effect of atmospheric air, and in a great measure avoiding the loss of time, the waste of gas, and the laborious operations necessarily attendant on the usual methods of charging and discharging retorts.

The retort which I have described is adapted for generating gas from coal, which is the material generally used for that purpose, but should any other material be used requiring a different adaptation of the several parts above described, such adaptation may easily be effected by persons conversant with the subject.—In witness whereof, &c.

Enrolled September 25, 1835.

Specification of the Patent granted to Thomas Fleming Bergin, *of Fair View Avenue, in the City of Dublin, Gentleman, for Improvements in Railway Carriages, which Improvements are applicable to other Purposes.* —Sealed March 4, 1835.

WITH AN ENGRAVING.

To all to whom these presents shall come, &c. &c.—*Now know ye*, that in compliance with the said proviso, I, the said Thomas Fleming Bergin, do hereby declare the nature of my invention and the manner in which the same is to be performed are fully described and ascertained in and by the following description thereof, reference being had to the drawing hereunto annexed, and to the figures and letters marked thereon (that is to say):

My invention relates to improvements on the apparatus called the "Buffing Apparatus," used in railway carriages. For the purpose of preventing or lessening concussions to such carriages consequent on starting or stopping, a train on the Liverpool and some other railways, an apparatus, called the buffing apparatus, has been had recourse to,

which apparatus consists of a series of rods and levers acting on semi-eliptical springs, the springs being similarly constructed to the eliptical carriage springs. The construction of this apparatus is well known, and I have only mentioned it in order to explain the meaning of the words buffing apparatus. The apparatus above noticed, though it has in some degree accomplished the objects for which it was designed, is exceedingly complex, and consequently expensive; in addition to which there are other objections which render this apparatus in some degree inefficient; amongst other objections it will be found that since applying the buffing apparatus to the Liverpool railway carriages, they no longer proceed with a steady motion in the direction of the railway, but in travelling at high velocities they acquire considerable lateral motion, all which is consequent on the peculiar arrangement and manner of action of the various parts of the present buffing apparatus. Now the object of my invention is to apply arrangements or combinations of coiled springs with rods proceeding from end to end of the carriage which shall at once offer a most advantageous apparatus for receiving and transmitting the motion from one carriage to another, and also prevent any prejudicial effects of concussion in starting or stopping a train of carriages, and also be highly suitable for preventing any prejudicial effects taking place in the event of two trains coming in contact.

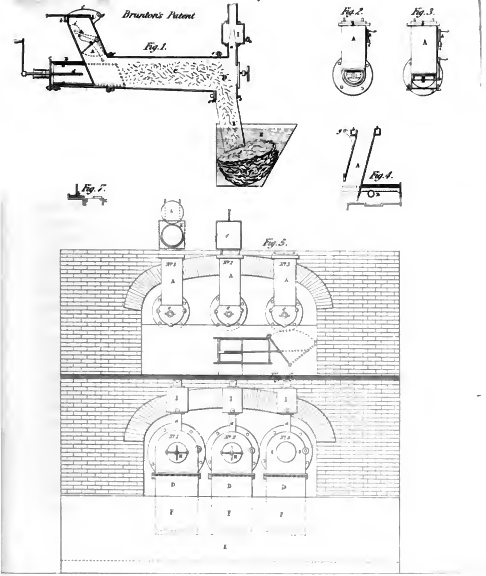
Description of the Drawing.

Fig. 1, represents an elevation of a railway carriage.

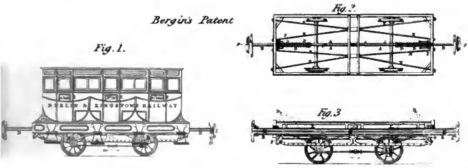
Fig. 2, is a plan of the under part of the same, the body being removed, and,

Fig. 3, is a section through the dotted line, P, P, P, fig. 2. [In these three figures the several parts, when visible, are distinguished by the same letters.] A slight frame, A, A, A, fig. 1, consisting of two similar plates of iron, each about $\frac{3}{16}$th of an inch thick secured to each other

Brunton's Patent



Bergin's Patent



London Hodson 112 Fleet Street Nov 1 1836

F. Mansell sc.

about three inches a part by suitable rivets, rests on turned bearings on the centres of the axles, a single bar, B, B, (I have used a welded iron tube of $\frac{5}{16}$th of an inch thick, and three inches diameter, as being the stiffest) the entire length of the carriage, and extending about two feet beyond each end is supported on this frame by rollers, C, C, C, fig. 3, allowing it to be moved lengthways with great facility. On this tube or bar, B, B, B, is placed at either end (within the framing of the carriage) about four feet of spiral or coiled springs, D, D, D, of graduated strengths, one end of each of these sets of springs rests against a strong collar or boss, E, fixed to the bar or tube, B, and the other end against a small box of iron, F, attached to the frame, A, and furnished with one of the rollers, C, also the two friction rollers, G, G, projecting a little beyond its surface, and resting against the inner side of the carriage frame end. To each extremity of the tube, B, B, is attached a buffer head, I, by means of a bar of iron, K, fig. 3, passing through, B, B, and furnished with a screw and nut at each end, immediately within each buffer head, and resting against it is a bar of iron, L, with chains and hooks for attaching the carriages together. It will be observed that this apparatus lying loosely on the axles is perfectly independent of the frame-work of the carriage, which is supported in the usual manner on bearing springs, M, M, and by means of the oblong holes in each end of the framing (H, H, fig. 3), through which the buffing tube or bar, B, passes, rises, or falls according to the load, without affecting the height of the buffing apparatus above the road. The action of the apparatus is as follows: the train being moved in the direction of the arrows, figs. 1, 2 and 3, the locomotive power is applied at, L, and draws forward the central tube, B, B, thereby compressing the springs, D, D, between the boss, E, and the friction roller box, F, which rests against the end of the carriage frame without moving the latter until the elastic force of the compressed

springs becomes sufficient to overcome the resistance presented by the friction of the carriage and load. The carriage then begins to move forward so slowly as to be almost imperceptible to persons seated therein. The second and each succeeding carriage in the train is by similar means brought from a state of rest into motion. In case of a concussion from behind, or of one carriage running against another, it will be at once seen that the resistance is offered by the furthest end, the effect being to drive the tube, B, B, forward, compressing the springs at the opposite end from where the concussion is given, and the carriage will be but little affected by the blow, until (as in drawing the train) the elasticity communicated to the springs by compression overpowers the resistance of the carriage, which then begins to move actuated by a force just sufficient to start it, any ordinary concussion might be thus resisted without injurious strain or violence to the carriage receiving the blows. The coiled springs are about four feet in length, allowing a range of action of about two feet beginning to be compressed by a force equal to about twenty pounds, and presenting a gross resistance to entire compression of upwards of two tons (but this strength of spring should be varied according to circumstances); that stated has been found suitable for carriages weighing, when loaded, about four tons. It will be observed that as the springs at either end of each carriage act totally independent of those at the other end, and of all the carriages in the train except that to which they are attached, each has but to bear its own share of the resistance of the entire train, the sum of which is made up of the separate resistances of all the springs acted on. By the use of this apparatus various advantageous effects have been realized, amongst others, perfectly steady forward motion in the trains, whereby very much of the side friction of the flanges of the wheels against the rails is avoided, and instead of that lateral motion heretofore generally experienced on rail-

ways, all the carriages constituting the train move forward in a steady path, and are rendered much less liable to go off the rails, and can be pushed before the engine, in case of necessity, with far greater confidence and less liability to accidents, as although the impulse is given to the bar from behind, yet it is obvious the carriage is acted upon from the front precisely as it would be if drawn in the same direction. In describing the drawing, I omitted to state that as the entire resistance to the action of the springs, D, D, is on the ends of the carriage frame, the centre of each is armed with a strong plate of iron about fifteen inches square, through which pass the tension rods, N, N, fig. 2, to the outer angles of the opposite ends of the frame, consequently these rods receive the entire force of the springs.

Having thus described the nature of my invention, and the manner of combining and applying the same, I would remark, that it will be evident that such apparatus is equally applicable to connecting of trains of carriages drawn by locomotive carriages on common roads, which, from the inequalities on such roads, will more particularly require such means of preventing the prejudicial effects of concussions, and I do therefore consider it to constitute part of my invention to apply such an apparatus to the purposes of connecting trains of carriages drawn on common roads by means of locomotive carriages. And I would have it understood, that I lay no claim to the various parts separately, which are shewn and described, nor in combination other than is hereafter distinctly claimed. I do therefore hereby declare that my invention consists of the combination of coiled springs, D, D, and the bar or tube, B, when applied as a buffing apparatus to connect railway carriages as above described, and also when applied to the further purposes of connecting carriages worked by locomotive machinery on common roads as above described.—In witness whereof, &c.

Enrolled May 4, 1835.

Specification of the Patent granted to Charles Schafhautl, *of Sheffield, in the County of York, Gentleman, for an improved Steam Generator.*—Sealed March 8, 1836.

WITH AN ENGRAVING.

To all to whom these presents shall come, &c. &c.,—*Now know ye,* that in compliance with the said proviso, I, the said Charles Schafhautl, do hereby declare the nature of my said invention, to consist in a steam generator formed of two cylinders placed either one beside the other or one within the other, and so arranged with reference to the furnace or fire as to expose a very extended surface to the action of the heat therefrom, while jets of air, and in some cases steam, are continually feeding the fire and increasing combustion therein. And in further compliance with the said proviso, I the said Charles Schafhautl, do hereby describe the manner in which my said invention is to be performed by the following statement thereof, reference being had to the drawing annexed, and to the figures and letters marked thereon, (that is to say):

Description of the Drawing.

Fig. 1, is a sectional elevation of one of my improved steam generators, where the two cylinders before alluded to are placed side by side. A and B, are two cup ends made of wrought iron plates half an inch thick, and flanged on to the bottom part of the working cylinders, G, H, which are bell shaped at their lower ends for the purpose; these cup ends are placed in the fire-place (fig. 1, F), which consists of a box made of iron plates lined inside with thin fire bricks of one and a half inch in thickness, which lining is distant from the cylinder about five inches (see ground plan of the fire place), and the box must be adapted to the shape of the two cylinders as shewn in such ground plan (No. 4); this box is sur-

rounded on the sides, except the top and bottom parts, with a casing, leaving a hollow space or air chamber of about three inches wide (fig. 1, *a*); this hollow space, during the working of the engine, is filled with compressed air, and serves as an air regulator to admit the compressed air into the fire; the sides of the furnace are perforated with twelve small tubes, *c*, or openings, which are directing the stream of compressed air against the bottom parts of the cup ends in about an angle of twenty degrees in the bottom of the furnace; just below the cup ends of the cylinder are two round openings containing a fire-grate, which may be closed if required; the two cup ends, A and B, are fixed to the working cylinders, G, H, as before described, and the working cylinders are fastened in the large iron frame, I, which frame supports the whole weight and resistance of the engine; the two pistons, K, K, are hollow boxes filling up the whole diameter of the working cylinders as air tight as possible; the pistons are cast from the very hardest quality of pig metal; on the top of the hollow boxes are screwed the piston rods, L, L. To the upper end of the working cylinders, G, H, are fixed stuffing boxes, *d*, *d*, as large in size as the diameter of the working cylinders, in which stuffing boxes the pistons are working up and down air tight. To the upper end of the working cylinders are fastened two blowing cylinders, M, M. The top of the blowing cylinders shut with a lid; through the middle of the lid works the air tight piston rods, L, L; on one side of the diameter of the lid is a valve opening inside, and on the other side of the diameter is a valve opening outside into the connecting air passage, *f*, *f*, which lets the air into the large horizontal air box, N, from which air box the compressed air is driven down through the passage, O, to the air regulator surrounding the fire box; on the top side of the air box, N, is a large safety valve opening outside, and balanced by means of an horizontal lever mounted with a

sliding weight to regulate the pressure on the valve from nought to every advantageous weight. To make the pistons work, a certain quantity of water is alternately ejected into each of the cup ends through a jet pipe, *g*, which spreads the water downwards against the sides and bottom of the cup ends. To inject alternately the water into the cup ends in certain quantities, I have constructed the following machinery;—the two jet pipes, fig. 2, *g*, *g*, are carried outside the furnace to the front of the working cylinders, and each are used for both the following purposes (that is to say), not only for injecting the water but also for the steam to escape through; to effect this double purpose, to the upper end of each pipe is fixed a stop cock, the plug of which has a hole through it, as shewn in the drawing (fig. 2), of the size of the internal dimensions of the steam escape pipe. The four sides of the cases of the plug are perforated with four holes (figs. 2 and 3, *o*, *p*, *m*, and *l*), and at each stroke of the piston two holes of the casing must coincide with the two openings of the right angular hole of the plug figs. 2 and 3. *l*, is connected with the injecting and escape pipe. *m*, is connected with the horizontal feeding pipe, P, (figs. 2 and 3,) from the middle of which feeding pipe ascends the vertical pipe, *r*, to the feeder, Q, which is the reservoir or supply of water. *q*, is a stop cock in the feeding pipe, P, to regulate the quantity of water. *s*, *s*, are two holes in the vertical pipe, *r*, to allow the water in the reservoir, Q, to run down, and, T, is a piston which fills up the vertical pipe, *r*, to force the first injection into one of the cup ends, and, *u*, is a valve to allow the water to run from the feeder into the horizontal feeding pipe, and prevent the water from being driven backwards; the two plugs turn together in the same direction through a space of three quarters of a circle; during the rising of one of the pistons the plugs turn forwards; during the descent of the piston the plugs turn backwards. The relation of

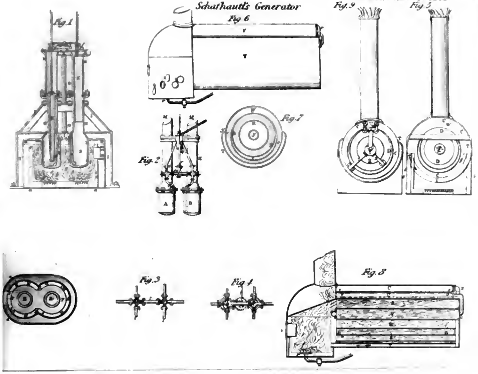
the two angular holes in the two plugs in each of their three different positions is shewn by the drawing, figs. 2, 3, and 4.

Suppose the injection is made into the cup end, A, the water is converted instantly into steam of an elastic force, which depends upon the quantity of injected water, and drives the piston forwards, expanding itself while the piston of the other cylinder is descending; when the piston of the cylinder, A, has nearly reached the top, both cocks, turning a quarter of a circle, will then be in the position, fig. 2, the way for the steam which is escaping with great force from the cup end, A, is opened to the feeding pipe, and the steam presses against the water in this pipe and forces it through the stop cock of the cylinder, H, in fig. 2, into the cup end, B; as soon as this injection is made, the two stop cocks turn a quarter of a circle in the direction of the arrows, and the communication of the cup end, B, with the injecting pipe, is stopped, and the passage, O, of the cup end, A, opened, fig. 2, so as to let escape the remaining quantity of steam; during the descent of the piston the escaping steam by means of the steam escape pipe is driven back to the water reservoir, the relative position of the two steam cocks at this time will be as in fig. 3; the steam is escaping through, O, in the line of the arrow, and the emptied horizontal feeding pipe, P, is filling itself with water for a new injection through the middle valve (fig. 2, *u*), and the communication pipe, *p*, of the cock which belongs to the cup end, B, during the rising of the piston in the cylinder, H; a few moments before this piston has arrived near the top of the cylinder, the piston turns both cocks backwards, and the play of the cocks is the reverse of the above described, fig. 4. To produce the motion of the cocks each cock bears on the top of its plug a cog-wheel, fig. 4, which two cog-wheels are turned by a larger one, which is fixed between the two smaller ones; to this large wheel is attached an iron rod which reaches to the

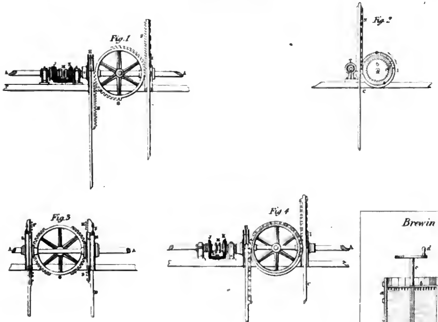
piston rod, and is moved upwards and downwards by this piston rod, with the beginning and ending of each rise and fall of the piston rod, in the same manner as the air-pump rod of Watts' pumping engine opens and shuts the valves. The present drawing of the engine is calculated for an engine of twenty-eight horse power; the quantity of water to be injected in this as well as in engines of all other dimensions should never be more than to cause a pressure of sixteen atmospheres; when the piston is in its highest position the steam generators must always be surrounded with fuel, and for that purpose such a feeder as is in general use for common engines is well adapted for this engine. To preserve the outside of the cylinder from burning, I have welded to the outside of it a thin sheet of platina; if the iron and thin sheet of platina are heated in a pure charcoal fire, till the iron has acquired a good welding heat, the iron and platina will be found to weld very easily together. Platina which is made from platina sand in the dry way, and consequently contains a certain quantity of iridium and other metal of platina sand is much preferable to the chemical pure platina: should, however, the platina in a larger scale be found too expensive, a coating of paste made of Stourbridge clay or powdered cinders, from charcoal fineries, mixed with a little borax, and drawn on the surface of the red hot metal cylinder, prevents the cylinder from being injured by the three following attacks; first, from the sulphur of the coke, which converts the surface into sulphurate of iron; secondly, from the carbon of the coke, which causes a very quickly melting carburet of iron; and thirdly, from the oxygen of the atmosphere, which burns or oxydizes the iron; the surface of the inside of the cylinder when very highly heated in the first state during the dropping in of the water is quickly coated with black oxyde of iron, which melts and makes a glassy surface, and preserves the iron as well as the water from further decomposition.

Fig. 6, is a side elevation of one of my improved steam

Schathautl's Generator



Schathautl's Gear



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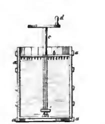


London. Published by Hodson 112 Fleet Street, November 1st 1836

F. Mansell, fc.

generators with a steam chamber as in the common high pressure engines. In this case the furnace must be of a semi-circular form, the bottom grate opened and surrounded with six or twelve drift-holes, Nos. 6, 6, just above the twelve blowing pipes, figs. 5 and 6. A small jet of the escaping steam is let through the bottom grate, *v*, into the highly ignited fuel, the steam is then immediately decomposed; the oxygen of the water combines with the coke's increasing its heat, and the hydrogen escapes, burning in a large light blue flame: the two double cylinders, C and D, shewn in the cross section, fig. 7, are placed one within the other for this purpose, and made from best copper or iron plates, and of the strength commonly used for high pressure engines of five or six atmospheres; the smallest of these double cylinders, D, is placed inside the larger one and fixed with its top line, *w*, to the inner line of the largest cylinder, C, as shewn in fig. 7, the dark shades, R, S, are the spaces for the draught through which the flames go, and, T, is the space between the sides of the largest cylinder, and its casing through which the flame and air return into the chimney fixed over the fire place, seen best in fig. 5; the current of air drives the flame through the spaces, R, S, and returns through the flue, T, which surrounds the fire place into the chimney which is fixed over the fire box, and causes, through the additional heat of the fire box, a very powerful draught.

Fig. 8, is a longitudinal section of figs. 6 and 7.

Fig. 9, is the end of the two connected cylinders opposite the fire place, surrounded by the casing of iron plates, T, T. Nos. 2 and 3, are the feeding pipes which feed the cylinders, C and D, with water through the large central pipe, Y, which is longer than the two large cylinders, C and D, and touches the back side of the casing, T, T. No. 1, lets the steam from the cylinder, Y, into the steam chamber, U, U. *x*, *x*, in figs. 8 and 9, are two steam communicating pipes. *z*, in fig. 8, is the water cylinder

which receives its water from a force pump. When the cylinders are constructed of copper, I fill up the spaces between the double cylinders in fig. 7, to the line, *y, y*, with spiral rolls of a net made from zinc wire of the thickness of about one-sixteenth part of an inch, and the loops of this net are about half a square inch in width; but if the cylinders are constructed of iron, I bind the spiral rolls of zinc with copper wire of the same dimensions as the zinc wire, the evaporation begins very rapidly from the surfaces of those net rolls without generating large bubbles or an ebullition, and likewise any incrustation of the cylinders is prevented, and the thick mud can be washed out very easily. Now whereas I claim as my invention the steam generators hereinbefore described, and such my invention being, to the best of my knowledge and belief, entirely new and never before used within that part of His said Majesty's United Kingdom of Great Britain and Ireland called England, His said dominion of Wales, or town of Berwick-upon-Tweed, I do hereby declare this to be my specification of the same, and that I do verily believe this my said specification doth comply in all respects fully and without reserve or disguise, with the proviso in the said hereinbefore in part recited letters patent contained. Wherefore I do hereby claim to maintain exclusive right and privilege to my said invention.—In witness whereof, &c.

Enrolled September 8, 1836.

Specification of the Patent granted to CHARLES SCHAFHAUTL, *of Sheffield, in the County of York, Gentleman, for an improved Gear for obtaining a continuous Rotatory Action.*—Sealed March 4, 1836.

WITH AN ENGRAVING.

To all to whom these presents shall come, &c. &c.,—*Now know ye*, that in compliance with the said proviso,

I, the said Charles Schafhautl, do hereby declare the nature of my said invention to consist in two rack or chain and pulley motions, actuated by two alternating piston rods, in such manner as to produce a continuous rotary action of the shaft on which the pulleys are placed. And in further compliance with the said proviso, I, the said Charles Schafhautl, do hereby describe the manner in which my said invention is to be performed by the following statement thereof, reference being had to the drawing annexed, and to the figures and letters marked thereon, (that is to say):

Description of the Drawing.

Fig. 1, is a back view of the gear, shewing one piston at its extreme elevation, and the other at its extreme depression, or, in other words, one piston at the end of the upstroke and the other at the end of the down stroke. A, is a shaft or axle round which the pulleys (which are loose pulleys) move in manner hereinafter described. This shaft serves also as the direct working shaft when required. B, C, are two piston rods supposed to be working in two ordinary steam cylinders. E, F, are two racks one on the side of each piston rod with a connecting wheel, G, by means of which the up stroke of one piston rod causes the down stroke of the other. H, I, are two loose pulleys. These pulleys are made with two grooves each in order to receive two chain bands, one from the top and one from the bottom of each piston rod, each passing half round its pulley in different directions, fastened at one end to the piston rod, and at the other to the pulley so that as the piston rods move up and down the pulleys are turned first half round one way and then half round the other, each pulley turning the reverse way to the other. The pulleys are placed over and work round ratchet wheels fixed within the pulleys on the axis, A, a click or paul being attached within each pulley in such manner as to drive round the ratchet wheel, and

consequently the axis when the pulleys move in one direction while they cease to act when the pulleys are moving in the contrary direction. I, K, L, are merely three bevelled wheels with a coupling box, M, for reversing the motion obtained from the shaft, A. The circumference of the pulleys at the part on which the chains lie, should, of course, be just twice as much as the length of the stroke of the piston rod.

Fig. 2, is a side view in section of the said gear, N, being one of the chains fully unwound, the other chain on the same pulley being shewn in dotted lines wound on to the full extent. O, is one of the ratchet wheels before mentioned, fixed on, and therefore moving with, the main shaft or axis. P, is the click or paul fixed to the inside of the pulley so that when the pulley is moved in the direction of the arrow, the main shaft or axis does not turn but at each rise of either piston rod, when the corresponding pulley turns in the contrary direction, the click or paul catches in the ratchet wheel and drives the main shaft round, and thus each rising piston taking it in turn to force round the axis, a continuous rotary motion is kept up by the alternation of the pistons. T, is a grooved friction roller placed against the back of the piston rod, which is made with a rib to work in the groove, and is kept steady by it; there is one to each piston rod.

Fig. 3, is a front view of the said gear. The pistons in this figure being shewn at the half stroke, and the piston rods consequently level in height, similar letters being used to denote similar parts in all the figures, no further description of this figure will be required, except to state that, Q, is the chain shewn in dotted lines as lying over the pulley, I, at fig. 2, and R, S, are the chains of the other pulley, H. Now whereas it is evident that chains and a pulley may be used instead of the toothed connecting wheel, G, as exemplified at fig. 4, and I claim as my invention the gear hereinbefore described, such invention being, to the best of my knowledge and belief, entirely new

and never before used within that part of His said Majesty's United Kingdom of Great Britain and Ireland, called England, His said dominion of Wales, and town of Berwick-upon-Tweed. And I do hereby declare this to be my specification of the same, and that I do verily believe this my said specification doth comply in all respects fully and without reserve or disguise with the proviso, in the said hereinbefore in part recited letters patent contained. Wherefore I hereby claim to maintain exclusive right and privilege to my said invention.—In witness whereof, &c.

Enrolled September 4, 1836.

Specification of the Patent granted to Francis Brewin, *of the Old Kent Road, in the County of Surrey, Tanner, for certain new and improved Processes of Tanning.*—Sealed January 11, 1836.

WITH AN ENGRAVING.

To all to whom these presents shall come, &c. &c.—*Now know ye*, that in compliance with the said proviso, I, the said Francis Brewin, do hereby declare that the nature of my said invention, consists in the making or preparing a new liquor or liquors for tanning or manufacturing raw hides and skins into leather, and for retanning leather manufactured in the ordinary way from certain exotic substances, which have not heretofore been in use for manufacturing leather in this country, or from a combination of these substances with other materials already in common use, by means of which new liquor or liquors, leather can be manufactured of a superior quality in less time than usual, and at much less expense, and by which also leather manufactured in the ordinary way may be improved in quality. And I declare that the manner in which the said invention is to be performed, is fully

shewn and set forth in the following description thereof, (that is to say):

Description of the Drawing.

I employ in the making and preparing of the said new tanning and retanning liquor or liquors, certain substances known in English commerce by the names of gum-kino, divi-divi, and terra-japonica, all of which I find contain much larger proportions of tannen than the best English oak bark, and yield liquors, possessed respectively of the following properties:—a solution of gum-kino imparts to leather a brownish red colour, but improves it considerably in point of closeness and firmness of texture; a solution of divi-divi gives a very light colour to leather; a solution of terra-japonica, of the sort generally imported in small square pieces, gives a dull light colour, and one of terra-japonica of the sort generally imported in large cakes, a brownish red similar to that obtained from gum kino. A solution of divi-divi I prepare in the same way as the ordinary bark liquors are made in vats or lecks by tanners. But gum-kino and terra-japonica require to be treated in the manner following. If the gum-kino is in large pieces or if the terra-japonica is of the sort which is sold in large cakes, I first break these large pieces and cakes with a hammer into small pieces; I then steep the whole for about three days in cold water, or cold weak tan liquor; after which I put the whole into what I call a rubbing tub of the construction shewn in the drawing in the margin hereof, for the purpose of being still farther reduced; or I use hot water, or hot weak tan liquor, in which case I put the whole of the materials at once into the rubbing tub and leave them to steep for about an hour only, which last process is that which I prefer. This tub (*a*) is about five feet deep and four feet wide in every part, and has a loose cover (*b*) just so much smaller to it in circumference that when not kept up by the materials in the

tub it will readily fall to the projection or stopper (*e*), fixed at about four inches from the bottom, and in this cover, on the under part thereof, about one hundred spikes of copper, wood, or any other material that will not stain the liquor, of about three inches long, are firmly inserted. A square wooden shaft (*c*), about five inches thick, with a wheel or handle (*d*) at top to turn it by, is passed through an orifice of corresponding size and description in the centre of the cover (*b*), and drops into a recess in the bottom of the tub, large enough to allow the shaft to turn freely within it. The materials having stood sufficiently long for steeping, the shaft of the tub is worked round by manual or other power, which carries around with it the loose cover with the spikes underneath, till, by the stirring and rubbing action of the spikes, the pieces of the gum-kino or terra-japonica in the tub, are either successively dissolved or reduced to such small dimensions as to pass easily between the cover and the sides of the tub; and in order that the said cover may press continually downwards on the materials in the tub, and descend as the materials become dissolved or reduced to the dimensions aforesaid, a heavy weight or weights is or are placed and kept on the top thereof during the whole of the operation: and in preparing the said solutions for use I employ more or less water or weak tan liquor, according to the sort of leather which is intended to be manufactured; (that is to say,) for sole leather I use about fifty to one hundred pounds of the gum-kino, or of the divi-divi, or of the terra-japonica, with about one hundred gallons of water or weak tan liquor; and for manufacturing dressing leather I use with every fifty to one hundred pounds of the divi-divi and light terra-japonica about three hundred gallons of water or weak tan liquor, rarely using the gum-kino or dark terra-japonica at all in the manufacture of dressing leather, or any sort of leather in respect to which colour is an object; or instead of at once dissolving the said materials in the said

proportional quantities of water or tan liquor, I dissolve them at first in any smaller quantities of water or weak tan liquor, and afterwards reduce the solutions to the required strength by the addition of water or weak tanning liquor; and when I have, by the processes aforesaid, obtained the requisite solutions of gum-kino, divi-divi, light terra-japonica, and dark terra-japonica, I generally mix for sole leather the different solutions together in a common tan vat in the following proportions; (that is to say,) one quarter of the solution of gum-kino, one quarter of the solution of divi-divi, one-eighth of the solution of the dark terra-japonica, and three-eighths of the solution of the light coloured terra-japonica; I then put into the liquor so prepared and compounded, about one-fourth more raw hides or skins than would in general be put by tanners, into an equal quantity of bark liquor, and with every hide I put on an average about one pound of oak bark in the same way as tanners now use bark in the vats with hides and skins. For manufacturing dressing leather I mix the solutions of divi-divi and light terra-japonica, prepared as before mentioned, and put the hides or skins into them with the same proportions of bark and liquor as are hereinbefore directed to be used in the case of sole leather. When the leather is required to be of a very close and firm texture, and the colour is a matter comparatively unimportant, I make use of a larger proportion of the liquor of gum-kino than is before directed, and when the dark terra-japonica is low in price, and when the colour to be given to the articles is immaterial, I also make use of a larger quantity of that material than of any of the others; and when it is desired to have the leather of a colour lighter than that which results from the combinations of all the four liquors in the proportions before recommended, I diminish the proportional quantities of the dark colouring substances according to the particular shade of colour required to be given to the article. And whereas some one or more of the said ar-

ticles may occasionally be so scarce in the market, or so high in price that it may not be practicable or economical to employ it or them in the quantities before recommended with the other substances, I declare that the use of any one or more of the said substances may be dispensed with either wholly or partially, but subject to the following modifications in the effects produced; (that is to say,) if gum-kino be used alone the leather produced will be too hard and close for general purposes; if divi-divi be used alone, it will produce leather lighter in colour than usual; if terra-japonica be used alone, an article will be produced possessed neither of that firmness nor that colour which is generally desirable in leather, while, by the addition of divi-divi to gum-kino or terra-japonica, a better article is produced than can be obtained from either gum-kino or terra-japonica separately. And whereas also the prices of all the four articles aforesaid may, at times, rise so high that, notwithstanding their superior tanning properties, they cannot with economy be entirely substituted for oak bark, or any of the other barks or tanning materials now in common use, I declare that the same may be advantageously used in combination with the said common materials in the proportions following; (that is to say,) any given quantity of gum-kino, divi-divi, and terra-japonica, mixed in the proportions before recommended, may be combined with any quantity of oak bark; or any given quantity composed of six-twelfth parts of light terra-japonica, four-twelfth parts of divi-divi, and two-twelfth parts of gum-kino may be combined with an equal quantity of mimosa bark or kermac root; or any given quantity composed of gum-kino, divi-divi, and terra-japonica, in equal proportions, may be combined with two-eighth parts of valonia and two-eighth parts of oak bark; or, lastly, eight parts of gum-kino, divi-divi, and terra-japonica may be combined with two-eighth parts of oak bark and one eighth part of shumach. When gum-kino, or divi-divi, or terra-japonica,

or any of them, are intended to be used along with oak or other bark, they may either be ground very small in a common bark mill, after being well dried, if not sufficiently dry for grinding in their original state, and then mixed up with the bark, or the bark and divi-divi may be steeped by themselves in the taps, and the liquor drawn off and made hot, and then put in such quantity into the rubbing tub as is necessary to dissolve the gum-kino or terra-japonica, as before described, which latter method is that which I prefer; or water or weak tan liquor alone, either hot or cold, may be used to dissolve the new materials before mixing them with the common liquors; the liquors made from these various articles I prefer using of about the same tanning strength as those made from the new materials alone; and though the proportions in which I have hereinbefore directed the gum-kino, divi-divi, and terra-japonica to be mixed with each other, or with oak bark and others of the materials already in common use, are those which I have found to answer best under ordinary circumstances, I declare that the said proportions may be varied at the discretion of the practical tanner according as the taste of customers in respect to the colour of leather may vary, or according to any particular quality desired to be given to the manufactured article, or according to the comparative cost at different times of the different materials. And I declare that for retanning or improving leather made in the ordinary way, I put it into a fresh liquor, the same as is hereinbefore directed to be used for sole leather, and after it has remained therein for one day I handle it, I then allow it to remain in the liquor for from eight to fourteen days, after which I take it out and dry it, and, if necessary, restrike it; and I declare that what I claim as my invention is the making and preparing of a tanning liquor or liquors for tanning or for manufacturing raw hides and skins into leather, and for retanning leather manufactured in the ordinary way with gum-kino, divi-

divi, and terra-japonica, either employed separately or combined with each other, or with other substances already in common use, in the different proportions, and in the manner hereinbefore specified, or in any other proportions and manner which a change of circumstances may render more suitable; and such my invention being, to the best of my knowledge and belief, never heretofore used in this country, I do hereby declare this to be my specification of the same, and that I do verily believe this my said specification doth comply in all respects fully and without reserve and disguise with the proviso in the said hereinbefore in part recited letters patent contained; wherefore I hereby claim to maintain exclusive right and privilege to my said invention.—In witness whereof, &c.

Enrolled July 11, 1836.

Specification of the Patent granted to CHARLES WATT, *of Clapham, in the County of Surrey, Gentleman, for certain Improvements in preparing, purifying, and refining Tallow, Stuff, fatty Materials, and Animal and Vegetable Oils for various useful Purposes.*— Sealed September 8, 1836.

To all to whom these presents shall come, &c. &c.— *Now know ye,* that in compliance with the said proviso, I, the said Charles Watt, do hereby declare that the nature of my said invention, and the manner in which the same is to be performed, are particularly described and ascertained in and by the following description thereof, (that is to say):

My invention of improvements in preparing, purifying, and refining tallow, stuff, fatty materials, and animal and vegetable oils for various useful purposes, consists in subjecting rough fat, tallow, stuff, or other fatty materials, or animal oils to a process of boiling with water, and certain chemical agents, ingredients, materials, mixtures,

or compounds hereinafter stated, for the purpose of separating the same from foreign matters and impurities, and rendering the materials better and more fit for the various purposes for which they are used, and particularly, first, as regards tallow for the purpose of separating or liberating the tallow from the animal substances, containing gellatin, fibrin, albumen, or colouring matter, and if necessary, afterwards washing or purifying or refining the same in order to remove the said chemicals. And further, as regards animal oils, in submitting them to a similar process of boiling with certain chemical ingredients for the purpose of removing impurities and refining or purifying the same; and after this first boiling, washing or boiling them a second time with certain other chemicals, to remove or neutralize the former, and, at the same time, purifying, refining, or washing the oils. And lastly, in refining or purifying vegetable oils by operating upon them with certain chemical agents, materials, mixtures, or compounds, for the purpose of removing impurities, colouring, glutinous matters, or offensive odours therefrom; all of which processes or operations have for their object the preparing, purifying, and refining the various raw materials, and rendering them better and more fit for various purposes, and which I propose to carry into effect in the following manner. And in order that my improvements may be better understood, I shall detail the processes or operations, stating such proportions, quantities of water, acids, and other chemical agents, materials, ingredients, or compounds, as I have found best to answer the desired purpose; but I do not intend to confine myself to the precise quantities hereinafter stated, as the same may be varied to suit different qualities and states of foulness or coarseness of the stuff, rough fat, tallow, or oils, or other raw materials to be operated upon, as is well known to all tallow melters and refiners of oils. First, as regards the operation or process of rendering or preparing rough fat, stuff, or fatty

materials for the melting or refining and purifying of tallow, I proceed in the following manner: the rough fat, without the necessity of being previously prepared or chopped into small pieces, is to be put into a wooden rendering vat, furnished with a wooden steam pipe leading from a steam boiler or generator, and branching out into several other pipes placed in the bottom of the vat, and pierced with small holes in order to distribute the steam throughout the whole mass of materials under operation. To about each ton of rough fat in the rendering vat I add about four gallons of water and then let on the steam and continue it until the mass boils, when I add, as hereafter directed, the following chemical mixture or compound prepared an hour or more before it is wanted. First, I take four pounds of good sulphuric acid (which I prefer to be of the specific gravity of about 1900), which is gradually and continuously to be diluted by pouring it very slowly into two gallons of cold water contained in a wooden vessel, the water being repeatedly stirred with a stick during the mixing; or muriatic acid may be substituted for sulphuric acid, when eight pounds of it will be required instead of four of the former, and only half the quantity of water; in this case there is no necessity for any particular caution in the mixing as with sulphuric acid, as there is no disengagement of heat. To either of the above mixtures of diluted acids, when cold, I add one pound of good nitric acid, which I prefer of about the specific gravity 1045, and then half a pound of the bichromate of potassa, in order to supply an additional quantity of oxygen and to prevent any discolouration by the use of the nitric acid; and to these I add half a pound of oxalic acid; the whole is then to be well stirred, and, when sufficiently mixed, one quart or three pints of this compound (to each ton of rough fat or stuff) is to be put into the boiling materials in the rendering vat, at intervals of about every twenty or thirty minutes, and the boiling continued until the dabs or lumps are

nearly dissolved; when this is the case, I add to the materials under operation the following compound (prepared only at the time it is about to be used); I first (in the proportion of to every ton of fat or stuff) dilute or mix one pound of strong nitric acid with one quart of water, into which mixture I put two ounces of rectified spirit of wine, naptha, sulphuric ether, or spirit of turpentine; after this compound has been added to the fat under operation, the boiling is to be continued for about half an hour, and after all the dabs or pieces of fat are rendered or melted the steam is to be stopped off and the tallow left quiet about ten minutes for the purpose of allowing the refuse to settle, when the water and chemicals underneath the tallow are to be drawn off, and about two gallons of fresh water to each ton of rough fat or stuff is to be then put in the rendering vat, and the steam let on again and continued till the tallow has boiled about ten minutes. After this washing process, the boiling is to be stopped, and the materials left to settle, in order that the tallow may become cool and fit to be packed off. In rendering fish oils in wooden vessels that is boiling or melting, and partly refining and purifying, such as whale blubber, fish livers, and other parts containing fish oils, the following modification of the process is necessary. The rendering mixture in this case should contain the following proportion of sulphuric and muriatic acids: viz., four pounds of the former diluted with two gallons of water, as described in the former part of this specification (respecting tallow), and six of the latter acid also diluted with two gallons of water, these diluted acids are to be mixed together after the diluted sulphuric acid has become cold; and to this compound is then to be added and well stirred therewith, half a pound of bichromate of potassa and a like quantity of oxalic acid. This compound is to be added to the boiling rough materials containing animal oils at intervals of twenty or thirty minutes, in the proportion of two quarts, at each time of

adding, to every ton of materials under operation, until all the fatty or oily substance (such as whale blubber, livers of fish, and other parts containing oil) are reduced or rendered. This will be shewn on examining the mass under operation and indicated by any parts containing oil floating beneath the surface of the fluid oil, and above the surface of the water, and thereby the operator will know if the process is to be stopped or continued; after this operation is performed, the under liquids and chemicals may be drawn off, about two pounds weight of powdered chalk or marble to each ton of raw material is to be thrown into the vat and well stirred therewith, when the whole is to be boiled for ten or twenty minutes in order that the chalk or marble may combine with and remove any acid adhering to the oil. The now rendered or purified oil is then allowed to settle, when it may be removed for use. In the further refining and purifying of tallow, if necessary or thought desirable, at the time the fresh water is put into the vat after the pumping or drawing off the under water and chemicals, the rendering being completed, there may be added to every ton of tallow a half pound of green oxide of chrome or bichromate of potassa, and boiled with the materials under operation for about ten or fifteen minutes, by turning on the steam the colour, odour, and other properties of the tallow, will be much improved by the process. In refining and purifying animal and vegetable oils generally, when in their fluid state, as articles of commerce, I use the following process and compound:—to every ton of oil is to be added a quantity, say one quart of the before mentioned mixture of muriatic acid and oxide of chrome or bichromate of potassa, the oil being stirred well at each time this compound is added, the operation or commixture to be continued until all the offensive odour, colouring matter, or impurities are removed; I then introduce about three gallons of water to every ton of oil, and from two to three pounds of powdered chalk or marble,

to remove any acids adhering to the oils; the oil is then to be left quiet until all the chemicals and water have settled and it has become transparent, when it may be run off into barrels for use. In the case of palm oil, it being ordinarily in a solid state, it must be raised by artificial heat to the temperature of about 120 Fahrenheit's thermometer, and the refining mixture will require to contain in the proportion of about one pound and a half of green oxide of chrome or bichromate of potassa, and four pounds of muriatic acid to each ton of rough materials, instead of the former proportions, and, when the colouring matters are moved, the same quantity of chalk or marble is to be added as in the former case, and three or four gallons of water, and the whole raised to the temperature of about 150°, when the materials will become sufficiently fluid to allow all the chemicals to subside, and after they have been sufficiently stirred together, the whole may be left at rest a sufficient time to allow the oil to become clear and the chemicals to subside, when the oil may be used in various manufactures. Having now described my improvements, and the manner of carrying the same into effect, and in such proportions and quantities as I have found to answer the purpose, I wish it to be understood that what I claim as my improvement in the preparing, purifying, and refining tallow, stuff, fatty materials, and animal and vegetable oils, for various useful purposes, is the boiling and operating upon them by the following compounds, chemical agents, ingredients, or mixtures. First, I claim the combination of sulphuric and nitric acids, and muriatic and nitric acids, for the purpose of rendering in wooden vessels, and likewise oxalic acid, both singly and compounded, as described, and likewise the bichromate of potassa, as it much improves the tallow and prevents the occasional temporary discoloration occasioned by nitric acid; I likewise claim the combination of nitric acid with spirits of wine, naptha, ether, or turpentine, as evolving nitrous

gas and nitrous oxide for the purpose of rendering, and by their agency purifying and solidifying the tallow; I also claim the admixture of sulphuric and muriatic acids, and oxalic acids, in rendering fish oils, as whale, seal, cod, &c. &c. I also claim the combination of muriatic acid with oxide of chrome, by which combination there results a double effect, viz., the bleaching or purifying and refining effect of the bichromate of potassa, or oxide of chrome, with the immense evolution of chlorine gas resulting from the decomposition of the muriatic acid or bichromate of potassa, for refining and bleaching vegetable and animal oils, generally and particularly, as applied to palm oil, which I prefer operating upon at about the temperature of 120°, being that at which the effect is rendered most certain of success and steady operation.—In witness whereof, &c.

Enrolled September 8, 1836.

ORIGINAL PAPER.

The Rotatory Printing Machine by MR. ROWLAND HILL.

The steam printing press was introduced at the close of the year 1814, before which time all printing was done by hand-presses, and the rate at which large sheets as newspapers were printed, scarcely ever exceeded 300 single impressions* in an hour.

The insufficiency of the hand press to meet the growing demands of the public for newspapers was probably felt at a much earlier time, as in the year 1790, Mr. William Nicholson, editor of the journal bearing his name, obtained a patent for machines for printing upon various plans, and it is certainly the case that he then *indicated* very many of the modes of operation which, since his time, have been successfully developed by other machinists. Mr. Nicholson appears never to have carried out any of his plans

* Impressions on one side only of the sheet of paper.

to a successful termination. Whether he was unable to work out the numerous mechanical details, or wanted funds to meet the heavy and unavoidable expense of such undertakings, or could not induce those engaged in the trade to give his plans a fair trial, we have no means of ascertaining; certain it is, that whether succeeding machinists have or have not been indebted to him for their leading views, they have had still to encounter by far the most difficult part of their task, and in overcoming the various physical and mechanical difficulties which lay in their way, their powers of invention and their patience and industry must have been exercised in no ordinary degree.

When, however, the machine-presses were brought into action a great increase of speed was at once obtained.

During the twenty-one years which have elapsed since their introduction various and important improvements have been effected in their construction, and by the rapid and powerful machines now used in printing the daily newspapers, the surprising number of 4000 single impressions is sometimes given off in an hour.

The inventor of the machine, which is the subject of this paper, believes that he has effected improvements by which the rate of printing just named, great as it is, may be still further increased, and that in no trifling degree.

In order to explain the means by which this advantage is proposed to be obtained, it is necessary to notice shortly the construction of the machines now commonly in use.

The type necessary to the printing of one side of the sheet, consisting (for a newspaper) of about 100,000 separate pieces, are collected, and being arranged in proper columns, the mass is placed in an iron frame called a chase, which binds it firmly together, and the *form* (as the chase filled with type is technically called) is then transferred to the machine, where it is secured upon a strong iron plate, which plate being mounted upon truck

wheels, forms a carriage; and there is a small rail-road for it to run upon.

When tbe machine is in action this carriage, with the form upon it, of which the face* of the type constitutes the upper surface, is constantly moved backward and forward horizontally, and as it passes along, it comes in contact, first, with the inking apparatus, which consists principally of a number of cylindrical rollers covered with ink and lying horizontally, and which are set in motion by the friction of the surface of the type acting upon their lower sides as it runs under them.

Next the *form*, being now inked, passes under a large revolving iron cylinder about the form and size of an ordinary double drum; this lies horizontally, and its curved surface is covered by a closely wove blanket bound tightly upon it.

The paper as it is supplied to the machine, is made partly to encircle this cylinder, being held against it by tapes which move with the cylinder.

The surface of the type moving horizontally and the surface of the blanket-covered cylinder revolving with the paper upon it, have exactly the same speed, and as the type passes under the cylinder, that side of the cylinder which bears the paper is brought undermost and presses the paper upon the type whereby it is printed. The cylinder then rises a little, the type returns under it without contact and passes back to the inking rollers for another supply of ink, preparatory to the printing of another sheet; while the printed sheet, if the machine be constructed to hold one form only, now passes out from between the cylinder and the tapes, and is received by an attendant.

Simple and ingenious as this arrangement undoubtedly is, the experienced machinist will at once perceive that it has points in which improvement is at least highly desirable.

* That part which gives the impression.

That which is most objectionable is the reciprocating motion of the form and its carriage, which together are of considerable weight, varying perhaps from five cwt. to a ton, and it is obviously difficult, if not impossible, to keep such a heavy mass in very rapid motion when the direction of that motion has to be reversed every instant.

Also much time is occupied by the backward motion of the *form* by which the type obtains a supply of ink, and regains the position proper for the printing of a succeeding sheet.

And the rate of reciprocating motion really obtained, though not great, requires much power to produce it.

These defects appear to be unavoidable while the type forms a flat surface, as it is not practicable to make a flat surface move continuously.

Mr. Hill proposes to obviate these defects by affixing the type around a cylinder so that the surface of the type itself shall form a kind of outer cylinder, the whole resembling slightly an organ barrel with its projecting pins; and he has certainly overcome the principal difficulty as it appears, viz., the discovery of a mode of readily and securely attaching the pieces of type to the cylinder, and this without making it difficult to detach them for the purposes of correction, revisal, &c. Of the manner in which this is accomplished we shall speak presently.

The type so affixed upon a cylinder, together with the proper spaces for margin, occupy its whole circumference; the cylinder thus clothed is placed in contact with a blanket-covered cylinder of the same dimensions, and the two are connected by toothed wheels, and the paper is passed between them with moderate compression, just as a piece of metal is passed between the rolls of a flatting mill. An inking apparatus is attached by which a constant supply of ink is communicated to the type as it revolves.

As the type cylinder has affixed to it precisely the quantity of type requisite for printing a sheet on one side; and as there is no vacant space upon the cylinder except

for the margins, it follows that at each revolution of the cylinder exactly one sheet will be printed; and that the instant the printing of one sheet is completed, that of another will be commenced; no loss of time therefore can occur if the supply of paper and of ink be kept up.

Again the motion being rotatory, not reciprocating, there is no difficulty in making it rapid; and the machine has been repeatedly worked with great rapidity in the presence of numbers of persons, without injuring or disturbing any of its parts, and without deteriorating the quality of the printing.

In the machine which has been exhibited, there are two type* cylinders and two blanket cylinders placed thus $\underset{\bullet}{\overset{\bullet}{\circ}}\circ$: the paper in passing from left to right between the first rollers is printed upon its upper side, and in passing between the last rollers it has its lower side printed.

This arrangement, of course, requires two distinct inking apparatus, one for each type roller.

To supply the machine with paper in single sheets at the rate of two per second, at which rate the machine has hitherto been worked, would be difficult if not impracticable; the plan therefore has been to make use of a long scroll of paper as it is produced by the ordinary paper machines, the end of which being introduced between the rollers the machine then supplies itself by unwinding the scroll from a reel.

It is intended to cut the scroll up into single sheets by additional machinery, as it passes from the printing rollers.

The greatest difficulty which Mr. Hill has had to surmount in the construction of his machine, is, as we have already stated, that of fastening the small pieces of type upon the surface of a cylinder, and with firmness to re-

* One only has been covered with moveable type, the other has stereotype plates bound round it as a temporary arrangement.

tain their places even when they are turned upside downwards by the revolution of the cylinder, at which time their gravity combines with their centrifugal force in tending to displace them, and to effect this without throwing new difficulties in the way of correction, revisal, &c. We shall endeavour to explain how this is accomplished.

Each piece of type is slightly wedge-like in its form, so that when several are laid side by side, they form a segment or arch whose lower curve corresponds to the surface of the cylinder upon which the type is to be fixed*, and each piece, instead of the ordinary narrow notches in its side, made for the compositors convenience, has a very broad notch; when the type is placed together to form a line these broad notches in the several pieces range together, and form an arched chase capable of receiving a thin brass plate of corresponding form and dimensions, which, when applied, is wholly embedded in the chase. When a line of type with its plate, or scaleboard, so embedded within its substance, is compressed between the lines, and its plate thereby completely inclosed and kept in its place, it is manifest that no single piece of type can be displaced: if any move the whole line must move. Means have been adopted, which we have not space to describe, by which these plates are made to take their places in the course of the composition, with the utmost readiness and certainty.

The lines of type are placed in a kind of tray or galley, of the length and breadth of a newspaper column; the bottom of which tray is a portion of a cylinder, the curvature being in its breadth, not in its length, somewhat as though a stave were taken from a truly cylindrical cask, and used as the bottom of a tray, the curved side being uppermost. The lines of type are secured in the tray principally by horizontal screw pressure acting against the ends of the column of type; but as a precaution

* Mr. Nicholson proposed to use wedge-like type, and to affix them upon a cylinder, but he did not shew any sufficient means of so affixing them.

against a tendency to bulge, which sometimes occurs in a column of the great length required in a newspaper, a few of the embedded plates have small projecting tenons at their ends, which lock into certain chases in the sides of tray just described.

The upper type-cylinder of the machine exhibited has ten such trays answering to the ten columns upon one side of a newspaper*; each tray being filled with type has a proof taken from it by a small press, and, after correction, the type being made fast by tightening the horizontal screws with which the galley is provided, the galley itself is screwed upon the cylinder. When the ten galleys are so attached to the cylinder, they cover it completely, excepting the spaces left for margin, but any one galley can be easily removed and replaced without disturbing any other.

The galleys filled with type being firmly screwed to the cylinder, thenceforward form part of it, and are not removed until the printing is completed and the type is to be taken out for distribution, unless it should become necessary to stop the press for further revisal or the insertion of new matter.

The very rapid supply of ink which the machine demands, by reason of its great speed, appears to be fully maintained, and that with very good colour, by the inking apparatus attached.

Mr. Hill employs the trough (for containing the ink), with its ductor-blade and iron roller, having proper screws for increasing or diminishing the space between the blade and the roller, through which space a thin film of ink adhering to the surface of the roller passes from the trough as the roller revolves.

This ductor is in every respect of the usual construction; its roller turns very slowly: next to it Mr. Hill places another iron roller lying parallel with it and just touching it, but having a rapid motion equal to that of the

* The lower type-cylinder, which prints the other side of the paper, is temporarily covered with stereotype plates, as before named.

surface of the type, and this roller by gently but swiftly rubbing against the ductor-roller, takes off its ink in a much thinner and more extended film. It ordinarily moves about eighteen times as fast as the ductor-roller, therefore it ordinarily extends the film of ink brought out by the slow-moving ductor roller over eighteen times the amount of surface it first occupied.

Means are provided by which the relative speed of the ductor can be readily increased or diminished, and thus a very nice adjustment of the quantity of ink supplied to the type can be effected.

We have spoken incidentally of the great speed of Mr. Hill's machine; being worked by two men it throws off sheets of the size of the evening newspapers, at the rate of 7000 to 8000 perfected copies per hour. What rate can be safely given to it by the application of steam power it is difficult to determine. At the speed above named, a scroll of paper of the width of a newspaper, and from three miles and a half to four miles long, might be printed on both sides in one hour.

Before the introduction of printing-machines in 1814, the printers of large newspapers, confined in their operations by the slowness of the hand press, had no resource, under the pressure of urgent demand, but to set up a portion of their matter in duplicate, at an expense of some thousands per annum. It seems not improbable that the expected abatement or removal of the stamp duty may soon cause the demand for newspapers to overtask even the great power of the present machines.

Should such a pressure arise, and should Mr. Hill's machine prove as successful in extended practical operation, as the numerous experimental trials it has had give reason to expect, its introduction will probably bring relief in the same way as it was brought by the introduction of the machines first used.

LAW REPORTS OF PATENT CASES.

In the Common Pleas. Thursday, February 25, 1836.

Mackintosh and others *v.* Everington and others.

This cause originally commenced in the Vice Chancellor's Court, the plaintiff having obtained an injunction (ex parte) to restrain the defendant from making, using, and selling certain articles manufactured according to a patent some years ago granted to the plaintiff.* On an application by the defendants, the Vice Chancellor dissolved the injunction, leaving the parties to try the validity of the patent at common law. The present was therefore an action against the defendant for an infringement of the plaintiffs' patent, and was tried before the Lord Chief Justice (Sir N. C. Tindal) and a special jury.

Mr. Wilson explained the nature of the pleadings, and

Mr. Attorney General (*Sir John Campbell*) stated the case as follows :—My lord, and gentleman of the jury, my learned friend has stated the various issues formed; and you, gentlemen of the jury, will have to decide whether Mr. Mackintosh's patent for making waterproof fabrics for cloaks and other articles is valid or invalid. The cloaks are now very generally known, and have obtained great celebrity, and are of the greatest utility, so much so, that the patent has become almost as well known as the celebrated Mr. Watt's for steam-engines. Gentlemen, the patent was taken by Mr. Mackintosh in 1823, and has been respected generally by the public till Messrs. Everington and Ellis, and others acting in concert with them, within a few months, have infringed the patent right. The circumstance of no one having before called into question the right of the patentee till within about two years of its expiring, may be taken as a strong presumption in favour of the validity of the patent. Now for the first

* For copy of specification see Repertory, vol. 46, 2nd Series, p. 199.

time is the invention invaded, and an attempt is made to upset the patent, by stating that Mr. Mackintosh was not the inventor; that he had not fully specified the nature of the process sufficient to enable a workman to pursue the invention, as is required by the conditions of the patent. Before the patent, many endeavours were made to obtain a substance which, in rendering fabrics water or air proof, should still retain flexibility: there were cements of different kinds attempted to be used, but without success. Mr. Mackintosh applied Indian-rubber or caoutchouc; but I will call it India-rubber. The cement is made by dissolving that substance, and of that alone; the great object was to obtain a solvent for India-rubber, which solvent should be evaporated, and thus leave the India-rubber as a cement between two fabrics, thereby making those fabrics impervious to air and water. These materials so combined became of great value, being flexible as well as air and water tight. He specified his patent in the following manner [here the learned gentleman read the specification for which see Repertory, vol. 46, 2nd Series.]

Thus, gentlemen, you will perceive that Mr. Mackintosh fully and fairly describes the nature of his invention; he describes the process by which he carried the same into effect; he points out what was before known, and distinguishes that of which he claims as his invention, which consists in applying of the flexible cement composed of dissolved India-rubber in the manner he described, by putting it between two surfaces of fabric and then pressing them together, so that they should be united, and become, from the properties of the cement, air and water tight.

The patentee had considerable difficulty to encounter in bringing the invention into general public use. There was a prejudice got abroad, that although the cloaks kept out rain they stopped perspiration, and hence was injurious to health; but, after going to great expense, the use of the patent material became popular, and the in-

vention has only lately become very profitable. There was sometime back negotiations between Mr. Mackintosh and the defendants for entering into partnership, but it went off, and now the defendants were making cloaks and other articles precisely according to the specification I have read to you; (that is to say,) according to the substance of it, and certainly upon the principle on which that specification is founded. It therefore became necessary that the plaintiffs should vindicate their property, and hence through this action various pleas have been put on record. They say no patent was granted; in answer to this; we have the patent in court. They also say that they have not infringed; I shall be enabled to prove most distinctly that they have. I shall shew that, in the most public manner, they exposed these descripcription of articles in their shop for sale. We have some which we have purchased. I am, however, inclined to think that the two pleas on which they will principally rely on, are, first, that this process was publicly practised before the granting of the plaintiffs' patent; secondly, that there is no sufficient specification. I propose to make a few observations on each of these pleas. With respect to the novelty of the invention, there had been before this patent many attempts on this subject, and various experiments; that is the case with every invention; and if it were to be decided that a patent is invalid because experiments have been before made which approach the patented invention, which have come even within a step of it, were such to be held to be the law no patent could possibly be established. Many of the most important inventions by which the manufactures of this country have been so greatly improved have been but one step beyond what has been done for ages, and many have been but one stage beyond fruitless experiments which have been made and abandoned. Various cements had been made, but they, not being flexible, did not meet the object desired; there were, in all those instances,

other ingredients used which injured the properties of the other material, or India-rubber, therefore all previous trials were unlike that of Mackintosh, and this is proved by the fact that, until his patent, such waterproof articles were not to be purchased, indeed they were not known.

I will now turn to the sufficiency of the specification: I understand, from what has taken place in the court of chancery, that my learned friend will endeavour to shew that the solvent used by the patentee is not properly described, it is called *coal-oil*, which is one of the products in the distillation of coal for making gas.

Gentlemen, in considering this specification it should be understood that the solvent forms no part of the invention; we do not undertake to shew how coal-oil is manufactured, we state we use coal-oil, and that being a material which is known and can be purchased, that is sufficient; it is not to be expected that an inventor of one thing, shall of necessity, know how to make all the materials used in the production of his invention; it is sufficient that such materials should be known and purchaseable. The excellence of coal-oil is this, it is highly volatile, it having dissolved the India-rubber, is quickly evaporated, and leaves the India-rubber between the two surfaces of cloth, by which the fabric produced is rendered flexible and waterproof.

I will now call before you evidence by which I shall be able to shew that the invention is highly useful, that it may readily be carried into effect from the specification, and also that the defendants have infringed the patent.

Nicholas Wray examined by *Mr. Serjeant Bompas.*— I am engaged with Mackintosh in his manufactory; I have seen the specification. The patent was taken in 1823. India-rubber was used before, as was also coal-oil. Coal-oil is a substance which floats on the top of tar. The India-rubber is cut into small pieces, it is then put into coal-oil; we make it according to the specification; in exact accordance with it. That specimen was

made according to the specification; water will not pass through it; I cannot say as to air. I worked at Manchester ten years; there is none now made at Glasgow by Mackintosh.

Cross-examined by *Mr. Serjeant Wilde.*—I had nothing to do with the material brought from the gas works, nor do I know of any operation to which it is subjected to prepare it as a solvent for the India-rubber. The solution was brought to me prepared. The India-rubber was put into coal-oil, it stood there for a certain time, and the mixture was rubbed through a sieve to render it more even. We formerly put the dissolved India-rubber on to the cloth with a brush, and laid it smooth with a spatular. The cement is now put on by a roller and is spread by a brush.

James Fleming examined by *Sir William Follett.*—I have been in the service of the plaintiff; I superintended the making of waterproof fabrics; I obtained coal-oil from the Glasgow works. The coal-oil floats on the surface of ammoniacal water in gas works. The India-rubber is cut into small pieces and dissolved. I remained in the plaintiffs' employ till about 1825. I have not been engaged with him since.

Cross-examined by *Mr Serjeant Wilde.*—I received the oil from the gas works; the plaintiff has a work for purifying coal-oil. Some of the materials which came from the gas works went first to the factory. I have passed through the works; they were distilling the tar-oil; I did not attend to it. The men have free access to these works; there is no exclusion. I was engaged with the plaintiff before the patent. I believe the process of purifying was carried on before the patent. The cement was put on by a brush, during the time I was engaged, exactly according to the specification.

W. T. Brande sworn. Examined by *Sir F. Pollock.*—I am a chemist, have been so twenty years; I have read the specification of the patent. I have applied that

solution to paper, to linen, and to leather, on the plan or mode described in the specification; the result is, that the two coated surfaces adhered together and became impervious to water. I have made some other experiments with other substances by the direction of plaintiff, with a mixture made by a person of the name of Clark, of Bridgewater. I endeavoured to dissolve caoutchouc in a mixture of linseed oil and oil of turpentine. I found that by boiling the caoutchouc in the linseed oil, according to the directions in the paper which was given to me, the caoutchouc was decomposed, it became viscid, but it would not dry; but so far altered that it was, in my opinion, incapable of being applied to the uses there represented. The action of spirits of turpentine and linseed oil on India-rubber are perfectly different from the action of coal-oil, which softens it in the first instance, and then reduces it to a pulp. In that state it may be further diluted with coal-oil to any extent that is necessary, and then spread over linen or other articles, when the coal-oil gradually evaporates and leaves the pure caoutchouc in, I believe, an unaltered state. I am acquainted with the substance called coal-oil, which is, I believe, the common term used in gas works. I have known it as such certainly before the date of this patent in 1823. I have seen coal-oil myself floating on the water in the gasometer-tank, and capable of being drawn off from the surface of the gasometer-tank. The coal-oil which I used in my first experiment was sent to me by the plaintiff. I do not know whether if coal-tar be distilled it yields as one of its products coal-oil. I never distilled coal-tar to obtain coal-oil from it. I have obtained coal-oil from gas works myself in small quantities, and the use of the term of coal-oil in the specification could not, in my judgment, mislead any one. The mode of purifying coal-oil is well known. I believe that it either is purified or was purified on a large scale either in the gas works, or some establishment belonging to

them, by distillation. I should call it coal-oil both before it is purified and after it is purified. It may be more or less purified, still it is coal-oil, and I think any chemist or any common workman of competent skill would know that was the way to purify it.

Cross-examined by *Mr. Serjeant Wilde.*—There is not any article that goes by the name of naphtha which is obtained from coal-oil; I never heard of the article passing by that name obtained from the ingredients produced by the distillation of coal. I have seen coal-oil floating on the water at the gas works in the gasometers; it was not what we should chemically term a greasy substance, but a highly volatile oil, in the natural state, produced by the coal and deposited in the gas meters and gasometers. I can speak to having subjected it to experiment, and that it is not a fixed but volatile oil; and I have heard that it was manufactured on a large scale by one of our gas companies, and that they found they had no sale for it, and therefore gave up the manufactory. I only speak from hear-say; I think the gasometer which I saw held from three to four thousand cubic feet. I cannot speak to the quantity of oil I saw floating on the surface of the water; the depth of the film I do not know. I never tried to dissolve India-rubber in that oil which so floats, but I should presume it would. I do not know whether the article that now is produced in gas works in the preparation of the gas, and which passes by the name of coal-oil, whether that first passed by the name of coal-tar and afterwards took the name of coal-oil; I presume that which I used had been collected from various sources by distillation. There are several oils which will dissolve India-rubber, but there are few, I believe, that will dissolve it so as to permit it to be restored by evaporation to its original state; some of them decompose the India-rubber, but not all of them. In the first experiment I used a pint of coal-oil, in the second two gallons were employed. I should think very probably they employed

the tar and other materials collected from the various parts of the gas apparatus for the purpose of obtaining coal-oil by distillation. It is one of the products of the destructive distillation of coal—Whenever I have attempted to dissolve India-rubber in oil of turpentine I have obtained a glutinous compound, which certainly did not leave it in a state fit for its original purpose. I believe it a common thing to soften it in oil of turpentine; when I say dissolved, I mean a *bona fide* solution, not merely softening down India-rubber: I apprehend it cannot be dissolved in linseed oil without decomposition; heat must be applied, and then a portion of the India-rubber will be decomposed. Oil of turpentine will soften India-rubber, and reduce it, but with linseed oil it will not form a fair solution, nor be applicable to the same purposes. I believe the term coal-oil applies to the product of the coal as it is produced in the manufacture of gas, as well as to the real oil after it is rectified and purified. There may be a difference between the naphtha which is obtained from Italy and that from Trinidad; I think it is found colourless; but that which I have generally seen has been brown: it is naphtha when it is in a pure and highly volatile state; petroleum is more viscid; it is another form of bitumen; in fact, I believe when petroleum is distilled it yields a quantity of naphtha, and there remains behind a substance called asphaltim. I performed the experiment which I produced on two or three sheets of blotting paper, and two or three pieces of cloth of about the same size with a brush. I prepared them about the middle of December. I passed, in fact, a heavy roller over them; I was not alone when I prepared this; no person but my assistant was with me; neither Mr. Mackintosh nor Mr. Hancock, nor any person connected with them, were with me. I dissolved the caoutchouc in oil obtained from the gas works, under the name of coal-oil. I certainly did not go to the gas works to collect the oil myself, and bring it home and dissolve

the India-rubber. I presume all the specimens of coal-oil which I have seen have been distilled. I presume it; I am not certain that they were. I should presume also that the ammoniacal liquor is separated before they distil the remaining products. If I were in a gas establishment, and anxious to collect as much of the oil as possible, I should endeavour to pour it off as free as might be from the other ingredients and materials, and then I should re-distil it. I have never seen the process of preparing the solution at the plaintiffs'.

Re-examined by *Sir F. Pollock.*—Coal-oil is certainly subjected to a process of distillation on its first coming over. All the products of coal are necesssarily products of distillation; the tar, the ammoniacal liquor, the coal-oil, and a number of ingredients and substances which are formed, are all products of distillation. I have not the least reason to think there is any difference between oil after the first distillation and after its second distillation, except in its being more pure. I have reason to doubt, when it first comes over, wheher it would dissolve caoutchouc: a friend of mine was anxious to make a solution of caoutchouc, and he applied to me to get some coal-oil; I recommended him to go to a drysalters for it; he went to Mr. Jones, in Gracechurch Street, and procured it, which he put into my hands, and I dissolved the India-rubber; that was the article I effectually experimented with.

Henry Warburton, Esq M. P. sworn. Examined by the *Attorney General.*—I have for a good many years past paid attention to subjects of philosophy and chemistry; I am not aware of any such process being known before 1823, when this patent was taken out; for when it first came out it was spoken of as a process quite new by chemists. I remember its being produced at Dr. Wollaston's house. There was a society of gentlemen, called the "Chemical Club," which consisted of the most distinguished philosophers of this country, of which I was a member; it was frequently the subject of conversation

there, and spoken of as a novel and ingenious process; if there had been any other solvent known I must have heard of it. I certainly consider it a novel and ingenious process. I have no doubt that, from reading the specification, the fabric might be made; instead of manual labour there may be power from the steam-engine, and various processes for making the fabric more smooth at the time of laying on the dissolved India-rubber. I have never distilled coal-oil myself, but I have been at the gas-works, and I have seen the product of destructive distillation of coal. The obvious mode to purify it is to distil it with a moderate heat, though I cannot say so from any experiment: I should say that the heat at which it distils is so low that it could not undergo decomposition during the process.

Cross-examined by *Mr. Serjeant Talford.*—I must have first heard of this process about 1823 or 4; I was first informed of it by Dr. Wollaston as being a substance perfectly flexible and waterproof, and very light in its texture. I am not aware that the same kind of result had ever been produced before; I never heard of any thing made impervious to water and air, and being at the same time flexible, and that would bear the creasing about the person; nor am I aware that a gentleman named Clarke was manufacturing a patent article under the description I have mentioned: I never heard of it. A solution of India-rubber in ether has long been known, as described in works, as a varnish which was applied for rendering air balloons air tight; this varnish was not interposed between two folds, but as an exterior coating. There is great advantage in having it interposed between two substances, particularly for the purpose of making articles air-tight and waterproof, instead of spreading it over the surface.

Re-examined by the *Attorney General.*—I should think that the purified coal-oil is affected in a small degree by the quantity of tar it has in solution; it may re-

quire a larger quantity to produce the same effect if in an unpurified state. The oil found floating on the ammoniacal liquor, and the oil which is produced by the distillation of tar, are, I have no doubt, the same oil, but I have not made any experiment, they are both coal-oil possessing the same qualities. When coal is distilled for the purpose of making coal-gas, that is what I call destructive distillation. In order to produce it, a high temperature is required, but when it has been produced then it will evaporate at a low temperature, and that I do not call destructive distillation.

George Frederick Daniell sworn. Examined by *Sir F. Pollock.*—I am professor of chemistry of King's College; have read the specification. Coal-oil is an article well known in commerce; I knew it before the date of this patent, which was in 1823, but I cannot assign date to my first knowledge of it. I have known it ever since there have been gas-works; I got it from a drysalter, I think, in Thames Street, at Price and Co.'s. I sent for it as coal-oil. I wrote down on a piece of paper—*Coal-oil for the solution of caoutchouc;* which I sent by my assistant; and he returned home with the article. It was well known to me before, though I had none of it by me. I then pursued the process of dissolving the caoutchouc, and applying it to substances in the manner described in the specification, and found it succeed perfectly. When an article of this sort has been discovered, I presume there may be, in the course of the manufacture, improvements in the mode of laying down the cloths to receive it. Mechanical improvements would naturally occur to a person who was working on a large scale to do away with manual labour. They are not at all essential to the manufacture itself. This is a portion of the solution that I used; I have a specimen of the India-rubber after it has gone through the process of evaporation sufficient to shew the caoutchouc; it contains all the properties of the caoutchouc. According to my experience, this, which

is the evaporated solution, is not distinguishable in any of its properties from India-rubber; it has a slight smell, but nothing else, which is the remains of the coal-oil.

Cross-examined by *Mr. Rotch.*—In trying these experiments I sent to a dry salter for the coal-oil; I cannot say where I should have sent for it in 1823; perhaps to the gas works. When I say it is now better known, I mean its use is more extensive. I do not think any person in 1823 would have doubted what was meant by coal-oil. A great quantity of coal-oil is produced from coal-tar as well as from other products of gas work.

Re-examined by *Sir F. Pollock.*—In my judgment the substance that is to be used is clearly pointed out by the specification.

James White sworn. Examined by the *Attorney General.*—I went to Ellis and Everington's shop to purchase a waterproof cloak. I bought one that they recommended, and which they stated to be of their own manufacture.

Cross-examined by *Mr. Serjeant Talford.*—I am sure they told me that it was manufactured by themselves; it is labelled, "Fanshawe's improved Patent India-rubber Waterproof Cloak."

[*To be concluded in our next.*]

NOTICE OF EXPIRED PATENTS.

(*Continued from p.* 263.)

Pierre Erard, of Great Marlborough Street, Middlesex, Musical Instrument Maker, for certain improvements on piano-fortes, and other keyed musical-instruments. Communicated by a foreigner residing abroad.—Sealed December 22, 1821. (The term of this patent has been extended under the Act 5 & 6 W. 4, c. 83, for seven years. See Repertory, No. 25, new series, p. 58.)

George Linton, of Gloucester Street, Queen Square, Middlesex, Mechanist, for a method of impelling machinery without the aid of steam, water, wind, air, or fire.—Sealed December 22, 1821.

Richard Ormrod, of Manchester, Lancashire, Iron Founder, for an improvement in the mode of heating liquids in boilers, and thereby

accelerating and increasing the production of steam. Communicated by a person residing abroad.—Sealed January 7, 1822.

Richard Summers Harford, of Ebbw Vale Iron Works, Aberystwith, Monmouthshire, Iron Master, for an improvement in that department of manufacture of iron commonly called puddling.—Sealed January 9, 1822.

James Harris, of St. Mildred's Court, London, Tea Dealer, for an improvement in the manufacture of shoes for horses and other cattle —Sealed January 9, 1822.

William Ravenscroft, of Serle Street, Lincoln's Inn, St. Clement Danes, Middlesex, Peruke Maker, for a forensic wig, the curls whereof are constructed on a principle to supersede the necessity of frizzing, curling, or using hard pomatum, and for forming the curls in a way not to be uncurled; and also for the tails of the wig not to require tying in dressing, and, further, the impossibility of any person untying them.—Sealed January 14, 1822.

David Loescham, of Newman Street, Oxford Street, Middlesex, Musical Instrument Maker, and James Allwright, of Little Newport Street, Middlesex, Cheesemonger, for an improved keyed musical instrument, comprising in itself many qualities never hitherto produced in one instrument, and possessing those qualities in clearness of sound, quality, distinctness, forte-piano, delicacy of touch, and shake on the keys or notes, by increasing to forte and decreasing to piano, at the will of the performer. Communicated by a foreigner residing abroad.—Sealed January 14, 1822.

Alexander Gordon, of London, and David Gordon, of Edinburgh, Esquires, for certain improvements and additions in the construction of lamps, and of compositions and materials to be burned in the lamps, and which may also be burned in other lamps.—Sealed January 14, 1822.—(*For copy of specification see Repertory, Vol.* 41, *second series, p.* 262.)

David Gordon, of Edinburgh, Esquire, for certain improvements and additions to steam-packets, and other vessels; part of which improvements are applicable to other naval and marine purposes.—Sealed January 14, 1822.—(*For copy of specification, see Repertory, Vol.* 41, *second series, p.* 202.)

LIST OF NEW PATENTS.

Moses Poole, of Lincoln's Inn, in the county of Middlesex, Gentleman, for improvements in anchors, and in friction rollers, to facilitate the lowering and raising such

and other anchors, which friction rollers are applicable to other purposes. Communicated by a foreigner residing abroad.—Sealed September 15, 1836.—(*Six months.*)

William Pringle Green, of Falmouth, in the county of Cornwall, Lieutenant in the Royal Navy, for improvements on capstans applicable to ships and other purposes, and for methods or contrivances to reduce manual labour at capstans used at mines, such methods or contrivances strengthening capstans, prevents them being overpowered, and are improvements on the modes hitherto resorted to for the performance of work, such capstans, methods, and contrivances, being used conjointly or separately, and for raising ore and men from mines.—Sealed September 28, 1836.—(*Six months.*)

John Isaac Hawkins, of Chase Cottage, Hampstead Road, in the county of Middlesex, Civil Engineer, for an improvement in the blowing pipe of blast furnaces and forges. Communicated by a foreigner residing abroad.—Sealed September 28, 1836.—(*Six months.*)

George Crane, of Yniscedywyn Iron Works, near Swansea, Iron Master, for an improvement in the manufacture of iron.—Sealed September 28, 1836.——(*Six months.*)

William Neale Clay, of West Bromwich, in the county of Stafford, Manufacturing Chemist, for improvements in the manufacture of sulphate of soda.—Sealed September 28, 1836.—(*Six months.*)

Richard Pearson, of Saint Giles, Oxford, Organist of Carfax Church, Oxford, for certain improvements in drags or apparatus for retarding carriages.—Sealed September 28, 1836.—(*Six months.*)

John Ledyard Phillips, of Melksham, in the county of Wilts., Cloth Manufacturer, for an improvement in the manufacture of woollen cloths.—Sealed October 4, 1836.—(*Two months.*)

James White, of Lambeth, in the county of Surrey,

Engineer, for certain improvements on railways.—Sealed October 4, 1836.—(*Six months.*)

Charles William Stone, of Finchley, in the county of Middlesex, Mechanic, for improvements in harness for weaving purposes, and in the apparatus for making the same. Communicated by a foreigner residing abroad.—Sealed October 4, 1836.—(*Six months.*)

Henry Huntley Mohun, of Walworth, in the county of Surrey, Doctor in Medicine, for improvements in the manufacturing of fuel.—Sealed October 4, 1836.—(*Six months.*)

Samuel Tonkin Jones, of Manchester, in the county palatine of Lancaster, Merchant, for certain improvements in the tanning of hides and skins.—Sealed October 6, 1836.—(*Six months.*)

Miles Berry, of 66, Chancery Lane, in the parish of Saint Andrew, Holborn, in the county of Middlesex, Mechanical Draftsman, for certain improvements in machinery or apparatus for making or manufacturing metal screws.—Sealed October 6, 1836.—(*Six months.*)

John Sharp, of the Borough of Dundee, in the county of Torfar, in North Britain, Flax Spinner, for certain machinery for converting ropes into tow, and certain improvements in certain machinery for preparing hemp or flax for spinning, part of which improvements are also applicable to the preparing of cotton, wool, and silk for spinning.—Sealed October 8, 1836.—(*Six months.*)

Henry Scott, junior, and Robert Stephen Oliver, Hatters, both of the city of Edinburgh, for a certain improvement or improvements in the manufacture of hats, caps, and bonnets. Communicated by a foreigner residing abroad.—Sealed October 13, 1836.—(*Six months.*)

Frederick Benjamin Geithner, of Birmingham, in the county of Warwick, Brass Founder, for improvements applicable to the drawing or winding up of window and other roller-blinds or maps, which improve-

ments are also applicable to other useful purposes.—Sealed October 13, 1836.—(*Six months.*)

John Hemming, of Edward Street, Portman Square, in the county of Middlesex, Gentleman, for improvements in the manufacture of white lead.—Sealed October 13, 1836.—(*Six months.*)

Thomas Lutwyche, of Liverpool, in the county palatine of Lancaster, Manufacturing Chemist, for certain improvements in the construction of apparatus used in the decomposition of common salt, and in the mode or method of working or using the same.—Sealed October 13, 1836. —(*Six months.*)

John Ruthven, of Edinburgh, for improvements in the formation of rails or rods for making railways, and in the method of fixing or joining them.—Sealed October 13, 1836.—(*Six months.*)

Charles Pierre Devaux, of Fenchurch Street, in the city of London, Merchant, for a new or improved apparatus for preventing the explosion of boilers or generators of steam. Communicated by a foreigner residing abroad. —Sealed October 13, 1836.—(*Six months.*)

John Joseph Charles Sheridan, of Peckham, in the county of Surrey, Chemist, for certain improvements in the several processes of saccharine, vinous, and acetous fermentation.—Sealed October 20, 1836.—(*Six months.*)

William Bridges Adams, of Brecknock Crescent, Camden Town, in the county of Middlesex, Coach Maker, for certain improvements in wheel carriages.—Sealed October 20, 1836.—(*Six months.*)

Christopher Nickels, of Guildford Street, Lambeth, in the county of Surrey, Manufacturer of Caoutchouc, for improvements in preparing and manufacturing caoutchouc, applicable to various useful purposes. Communicated partly by a foreigner residing abroad.—Sealed October 24, 1836.—(*Six months.*)

THE

REPERTORY

OF

PATENT INVENTIONS.

No. XXXVI. NEW SERIES.—DECEMBER, 1836.

Specification of the Patent granted to WILLIAM HARTER, *of Manchester, Silk Manufacturer, for certain Improvements in Machinery for winding, cleaning, drawing, and doubling hard and soft Silk, which Improvements are also applicable to Machinery for winding, cleaning, and doubling Thread or Yarn manufactured from Cotton or other fibrous Materials.* —Sealed January 8, 1835.

WITH AN ENGRAVING.

To all to whom these presents shall come, &c. &c.— *Now know ye,* that in compliance with the said proviso, I, the said William Harter, do hereby declare that the nature of my said invention, and the manner in which the same is to be performed, are particularly described and ascertained in and by the following description thereof, reference being had to the drawing hereunto annexed, and to the figures and letters marked thereon (that is to say):

My improvements consist in the construction and arrangement of certain apparatus connected with the ordinary machinery by which I am enabled to perform the

various operations of winding, cleaning, drawing, and doubling silk, as well as winding, cleaning, and doubling thread or yarn manufactured from cotton or other fibrous materials, with much greater speed, with less breakage, and in a more perfect manner than that in which these operations are at present performed by the machinery in ordinary use, but, before I proceed to describe the manner in which the same are to be performed and carried into effect, I shall offer a few remarks respecting the manufacture of silk for the purpose of making the advantage of my improvements more obvious. Of all the various processes through which silk has to pass in its progress to the loom, or to any other final process of manufacture, few are so important and so difficult as that of winding the raw silk from the skein as imported, and on this being well performed depends very much the facility and well doing of the subsequent operations. The improvements sought for in the winding of silk are, greater speed in the operation, without (contrary to what has hitherto been the case) greater breakage, and, consequently, greater waste of this valuable material of manufacture. By the plans hitherto in use a very limited speed has only been acquired, say, that the hank or skein gives off seldom more than sixty yards per minute, and this limited speed could not be increased by merely driving the parts faster, without greatly increasing the breakage, and thus causing much waste of silk, besides loss of time in piecing up the broken parts.

The improvements which I shall hereafter describe possess the valuable property of a speed perfectly extraordinary (and which will be almost incredible to those persons in the silk trade who may not witness the operation), and with this property is combined the advantage of very much less breakage, and consequently fewer knots and less waste, besides that of laying the silk much harder on the bobbins, all which greatly contribute to the speed of the subsequent operations and the diminution of waste

incident thereto. There are also other important processes such as drawing, cleaning, and doubling, which in addition to the assistance they receive from the first operation of winding being done in an improved manner are themselves facilitated in an extraordinary degree by the application of the same principle.

Description of the Drawing.

The method by which these great advantages are obtained will be best understood by a reference in the first instance to fig. 1, which represents a front view of part of one of the winding frames now in use. A, A, are two friction rollers, wheels, or bosses on a spindle, B, one of which is fast thereto, and the other works on a screw at the other end of the spindle, so that the bobbin, *b*, *b*, is held firmly in its place on the spindle, B. The rollers, A, A, vary somewhat both in length and diameter, but those used on the same spindle are generally alike. These rollers, A, A, rest on what are termed friction pulleys, C, C, that is, circular discs of wood or metal which are supported upon and revolve with the driving shaft, D, and give motion to the friction rollers, A, A, resting thereon. By this arrangement the silk is wound on to the bobbin from the skein placed on the swift, E, and the requisite tension is effected by the drag or weight, F, suspended on the axis as seen in the drawing. The same principle is applied also to cleaning, drawing, and doubling, except that, in addition to the friction roller used in the latter process, there is a species of star or ratchet-wheel by means of which the bobbin is stopped when the thread breaks. This is one of the ordinary methods of winding by which a certain limited degree of speed is acquired, say a giving off from the skein or hank of seldom more than sixty yards per minute, which cannot be increased by merely driving the parts faster without frequent breakage and much waste of silk. I shall now proceed to describe my improvements for performing

the same process with greatly increased speed and less liability to breakage.

In the annexed drawing, fig. 2, represents a side view; and,

Fig. 3, a plan or bird's eye view of my improvements applied to machinery used for winding silk off the hank or skein on to the bobbin. In these figures D, represents the revolving shaft driven by any adequate power, which shaft is considered to revolve at the same speed as that in fig. 1. C, C, are the driving or friction pulleys which, by their contact and surface motion, impart rotation to the spindle, B, on which the bobbin, *b*, *b*, is placed, such pulleys being of the same diameter as those in fig. 1. But instead of the spindle on which the bobbin, *b*, *b*, is placed being provided with the rollers, A, A, as in fig. 1, the rollers are dispensed with, and the spindle itself is allowed to rest on the surface of the friction or driving pulleys, C, C, and the weight, F, on the axis of the swift, E, is also entirely dispensed with, and, to make the distinction between the ordinary winding process and my improved process more obvious,

Fig. 4, represents a spindle and bobbin of the ordinary arrangement; and,

Fig. 5, a bobbin and spindle of my improved construction, each at the full size. G, G, fig. 5, are two circular discs, flies or flanges, one of which is attached to, and forms a part of, the spindle, B, and the other is screwed on so as to hold the bobbin firmly in the proper position on the spindle. Now the necessary friction between the surface of the spindle and the surface of the friction pulleys, C, C, to produce the momentum requisite for obtaining and maintaining the increased speed and realizing the advantages offered by the elasticity of the atmosphere, as will be hereinafter explained, is not effected without the addition of these flies or discs, G, G, which not only increase the friction by adding to the weight of the revolving mass of which the bobbin forms a part, but also

perform the important office of partially retarding the rotation of the bobbin when motion is first imparted, thereby causing it to start gradually, and thus preventing breakage at the same time that they obviate the necessity of the attendant assisting the machine in getting into action, and also equalize and regulate the rotation after the spindle has acquired its maximum velocity.

This velocity being gained, the swift, from which the silk or other material is to be wound, revolves with a speed equal to give off even as high as one hundred and forty yards per minute from the skein or hank, and at a speed at which the atmosphere is found to present so much resistance as to obviate entirely the necessity of the weight or drag, F, as seen in fig. 1, and furnish a more uniform and elastic tension on the silk or other material in the process of winding than has been heretofore effected. Now although the friction between the surface of the friction pulley, C, and the surface of the spindle, B, is so much decreased as greatly to lessen the danger of breaking the silk or other material in the process of winding, even when the swift is held stationary by any obstruction, entanglement, or adhesion to the skein; yet the rapidity of the revolution of the bobbin and swift is such that the elastic resistance of the atmosphere on the skein, and the arms of the swift, produces a regularity of tension in the winding, which makes a harder and more uniformly wound bobbin than the weighted drag used to the axle of the swift in the ordinary process; for although it may seem a paradox that a decrease of force applied to the winding surface should place the wound material harder on the bobbin, yet the phenomenon is explained by more minute investigation; for instance, when the winding commences in the ordinary process, the silk or other material is placed on the bobbin at a tension depending on the amount of drag or resistance on the swift caused by the weight, F, but as soon as a slight obstruction, entanglement, or adhesion occurs in

the skein of silk or other material, the thread either breaks by the force of the winding process, owing to the large surface friction of the parts, A and C, as seen in fig. 1; or should the adhesion give way suddenly, the swift starts forwards and overruns the bobbin, causing what is called the back lash, when, if the silk comes off freely, it is wound loosely on the bobbin. On the other hand, when (as in my improvement) the speed of revolution is increased so as to make the resistance of the atmosphere available as a drag, this back lashing can very rarely occur, for as the resistance of the atmosphere depends on the velocity of the revolution of the swift, it cannot overrun or back-lash without overcoming a still greater resistance of the atmosphere. Thus I have found a less amount of force with a greater velocity applied to this process, according to my improved arrangement, not only to produce a harder and more uniform bobbin than those produced by the ordinary mode, but also greatly to diminish the amount of breakage.

After the foregoing description of my invention, and the remarks I have thought it necessary to make in explanation of the advantages presented by its adoption, the application of a similar arrangement of flies, and dispensing with the rollers or wheels, A, in cleaning, drawing, and doubling, will be obvious to manufacturers and others conversant with the subject; and, although I cannot avail myself of the resistance of the atmosphere to such advantage in winding from one bobbin to another, yet the reduced force exerted on the receiving bobbin, as already described, causes a less amount of breakage, while the speed disposes of the work with a despatch never before obtained.

Now I am well aware that the arrangement of the machinery for carrying my invention into effect may be much modified and varied, together with the materials of which the various parts are formed, for instance, the weight or fly which I place on the spindle, B, in the form of the

discs, G, may be added in the bobbin itself, or in some other way, the object being to obtain considerable momentum, with an exceedingly small degree of constant friction of surface, as above described, which friction may be readily overcome in the event of the silk being stopped by adhesion or otherwise, and it may also be found in some cases desirable to increase the resisting surface of the arms of the swift which pass through the atmosphere, all which variations must depend on the nature of the manufacture and material to be wound, cleaned, drawn, or doubled.

But what I claim as my invention or improvements in machinery for winding, cleaning, drawing, and doubling hard and soft silk, and threads and yarns manufactured of cotton or other fibrous materials, consists in dispensing with the ordinary friction rollers, wheels, or bosses, A, A, by which the bobbins have heretofore been driven by the pulleys, C, C, and in place thereof permitting the bobbin-spindle itself to be used for receiving the motion from the surfaces of the pulleys, C, C, and combining therewith weighted flies or other similar contrivances for enabling me to obtain the requisite momentum in the spindle, and to take advantage of the elastic properties of the atmosphere which is called into action by the great velocity of the swift in the process of winding, and for applying such improvements to machinery for producing the advantages hereinbefore pointed out in the process of cleaning, drawing, and doubling, as above described. — In witness, whereof, &c.

Enrolled July 7, 1836.

Specification of the Patent granted to John Filmore Kingston, *of Ilsington, in the County of Devon, Esquire, for a New Rotary Engine.*—Sealed January 28, 1835.

WITH AN ENGRAVING.

To all to whom these presents shall come, &c. &c.—*Now know ye,* that in compliance with the said proviso, I, the said John Filmore Kingston, do hereby declare the nature of my said invention, and the manner in which the same is to be performed, are fully described and ascertained in and by the following statement thereof, reference being had to the drawing hereunto annexed, and to the figures and letters marked thereon, (that is to say) :

My invention consists of a new arrangement of mechanical parts for producing a rotary engine, which may be caused to rotate by means of a flow of steam, or by a flow of water or other fluid, and thus be enabled to drive machinery as will be hereafter fully explained.

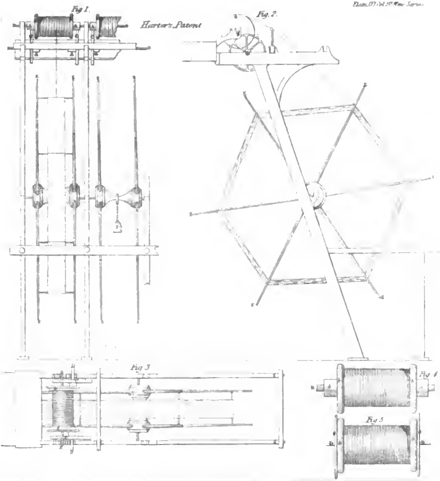
Description of the Drawing.

Fig. 1, represents a section of the engine.

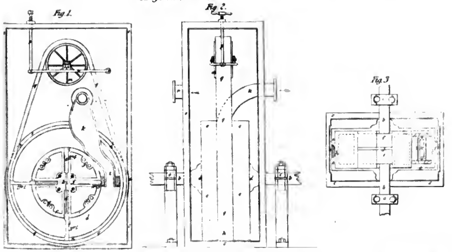
Fig. 2, is a tranverse section of the case in which the engine is enclosed.

Fig. 3, is also a section taken at the dotted lines, *a, a,* in fig. 1. In each of these figures the same letters are used to denote the same parts; *b,* is the main axis of the engine turning in bearings, *c, c,* on each side of the casing, as is shown in figs. 2 and 3. This axis is keyed or otherwise affixed to the two side plates, *d, d,* of the engine, and consequently turns with them. These two side plates, *d, d,* of the engine have projecting rings, *e, e,* affixed thereto or cast therewith, as is clearly shown in the drawing; and on the inner surfaces of these side plates, *d, d,* and in the rings, *e, e,* are formed grooves or guides in which the vanes or piston slide as they come into, and go

Harter's Patent



Kingston's Patent.



London. Published by Hodson 112 Fleet Street December 1st 1836.

F. Mansell sc.

out of action, as will be fully described hereafter; *f*, is a cylinder which is bolted to the side plates, *d*, *d*, at the parts marked, *g*, *g*; by this means the side plates, *d*, *d*, are retained at a distance from each other, and such is also the case with the rings or cylinders, *e*, *e*, which constitute parts of such side plates as is above described; by this means there will be an opening all round the cylinder, *d*, *e*, *f*, as is indicated at, *h*. In the cylinder, *f*, are formed four recesses to receive the four vanes or pistons, as is clearly shown in the drawing. The vanes or pistons, *i*, *i*, are attached in pairs by their rods, *j*, as is shown in the drawing; *k*, is the induction pipe, which, if the engine is intended to be worked by steam, proceeds from a steam boiler. This induction pipe passes through the opening, *h*, between the side plates and rings, *d*, *e*, as is shown in the drawing, to the point, *l*, where by means of packing, which I prefer to be metallic, as is shown in the drawing, the end of this induction pipe is made to fill the vacant space produced by the side plates, *d*, *e*, and the internal cylinder, *f*. Above the working cylinder is placed the wheel, *m*, the axis of which turns in suitable bearings on the levers, *n*, which levers move on an axis, *o*, and the levers, *n*, can be raised or lowered when desired, by the screw and rod, *p*, in order to tighten or slacken the endless band or strap, *q*, which constitutes the means of keeping the lower half of the steam cylinder steam tight. This endless band or strap I form of a series of woven straps of hemp or cotton, which are sewed together having black lead tempered with oil laid between the different layers or straps. The endless band or strap, *q*, at all times covers the opening, *k*, of that part of the cylinder which is required to be kept steam tight. This will readily be understood by an examination of the drawing; *r*, is the eduction pipe way for steam or other fluid; *s*, *s*, is the outer casing which contains the engine. This I have heretofore formed of wood lined with copper, but it may be constructed of other suitable material, and there is to be applied a cock to

the lower part of the case, *s*, to draw off the condensed water when steam is used.

Having thus explained the various parts, and the manner of combining the same, I will now describe the manner of action. In doing so, I will suppose that steam is flowing from a boiler through the induction way into and acting against the pistons, No. 1, and No. 2. The steam will be resisted by the end of the induction pipe, which performs the part of an abutment. The pistons, Nos. 3 and 4, will be within their recesses in the cylinder, *f*; the onward motion of the cylinder, *d*, *e*, and the band, *q*, will carry the piston, No. 3, beyond the abutment, and the piston, No. 1, beyond the point at which the cylinder is made steam tight by the band, *q*; by this means the steam will have free way to pass off through the eduction pipe, and the piston, No. 3, will descend by its own gravity, and be propelled forward by the steam, and a like action will take place with respect to the piston, No. 4, when the piston, No. 2, passes the point at which the cylinder is steam tight. By this means a continuous rotary motion will be communicated to the main axis of the engine, and from that axis to the machinery which is to be driven, and it should be stated, that, in order to reverse the direction of the revolution communicated to such machinery, it will be necessary to have suitable clutch boxes and wheels, as is well understood; and, in order to govern and control the working of the engine and keep the motion uniform, a throstle valve should be placed in the steam pipe in like manner to ordinary steam engines.

And I would also remark, that although I have here described and recommended the endless band, *q*, for keeping a portion of the steam cylinder steam tight, I do not confine myself thereto, as it will be evident that a stationary metallic band or strap proceeding only over that portion of the opening, *h*, which is to be kept steam tight, such band or strap being kept in contact with the parts, *e*, *e*, of the steam cylinder by means of suitable springs or other

means, but this arrangement is liable to the objection of a larger rubbing surface in comparison with the endless band, *q*, which, revolving with the steam cylinder, offers little friction in the working of the engine.

Having thus described the nature of my invention, and the manner of performing the same, I would have it understood, that what I claim as my invention is the mode of combining the side plates, *d*, *d*, *e*, *e*, and, *f*, leaving a space all round, a portion of which is made steam and fluid tight by an endless band or strap, or by means of a metallic band being caused to cover that portion which is required to be kept tight as above described.—In witness whereof, &c.

Enrolled July 28, 1836.

Specification of the Patent granted to FRANCOIS PEYRE, *Jun. of St. Entienne, in the Kingdom of France, Dyer, now residing at the White Hart Inn, in the Borough of Southwark, for certain Improvements in the means of economizing Fuel in Ships' Hearths or Cooking Apparatus, and of obtaining Distilled Water from Sea Water, which Improvements apply to Generating Steam.*—Sealed February 23, 1836.

WITH AN ENGRAVING.

To all to whom these presents shall come, &c, &c.,—*Now know ye*, that in compliance with the said proviso, I, the said Francois Peyre, do hereby declare the nature of the said invention, and the manner in which the same is to be performed, are particularly ascertained and described in and by the following description thereof, reference being had to the drawings hereunto annexed, and to the letters and figures marked thereon, (that is to say):

This invention of improvements in the means of economizing fuel in ships' hearths, or cooking apparatus, and

obtaining distilled water from sea water, and which also apply to generating steam for other purposes, is principally designed to promote a very rapid distillation of fresh water from sea or salt water, and in a better state for drinking than has heretofore been obtained, and which is effected in a ship's hearth, cabouse, or cooking apparatus, without consuming more fuel than that which is necessary to perform the ordinary cooking operations. The principal novel feature consists in causing a volume of heated air to be injected into the salt water contained in the boiler from time to time, as required, by means of a blower, bellows, or air-injecting pump, or other convenient apparatus for the purpose of increasing the ebullition and evaporation of the water. And further, these improvements consist in mixing with the sea water in the boiler alum and sulphuric acid, for the purpose of preventing the crystallization or incrustation of saline particles on the interior of the boiler, and preventing any impurities from passing off with the steam or vapour; and also after the water has been discharged from the apparatus, and mixed with a portion of sulphuric acid and charcoal, in blowing or forcing cold atmospheric air into such distilled water, for the purpose of taking away the disagreeable taste or flavour which distilled water generally has acquired, and restoring what may be called its aeriated properties, which have been destroyed or removed by the process of distillation, and rendering the distilled water more like spring or fresh water in taste, or flavour, and relish to the palate. The several figures in the accompanying drawings are representations of one construction of a ship's hearth, or cooking apparatus, which will serve to illustrate this invention, but I do not intend to confine myself to the precise form or arrangement there shewn, as the same may be varied to suit different circumstances. At each time the boiler is filled with sea water, and previous to any evaporation taking place, sulphuric acid and alum is to be introduced and

mixed with the water, in the proportion of about four ounces of alum and one ounce of sulphuric acid to about twenty-five gallons of salt water, or the alum alone may be used, if desired, the intention being that the sulphuric acid may arrest any deleterious vapours or other matters which might otherwise arise and pass off with the steam, and that the steam may assist in preventing the crystallization of the salt and its incrustation on the boiler, or the alum and sulphuric acid may be mixed with the sea water, previous to its being introduced into the boiler.

Description of the Drawing.

Fig. 1, is a front elevation of the cabouse complete, with the furnace, cooking apparatus, and condensers.

Fig. 2, is a plan or horizontal view of the same.

Fig. 3, is a vertical section taken in the line, *a, b,* shewing the interior construction of the furnace and its flues, with the boiler and its steam chamber or separator, and also the condensers or refrigerators.

Fig. 4, is a horizontal section taken in the line *c, d;* and

Fig. 5, is another horizontal section taken in the line *e, f.* The ship's hearth, or cooking apparatus, consists of four principal parts, viz. the fire-place, the boiler and its steam chamber, the condensers, and the bellows. A, is the fire-place, B, the boiler or generator, containing the salt or sea water; C, the steam chamber in which the boiling or stewing cooking vessels, *a, a, a,* are placed, fitting steam-tight into the top of the chamber; D, D, are the condensers, one or both of which may be used at one time; E, is the bellows or air pump; *b, b,* are the covers for baking meat or other food, and are placed one on each side of the fire-place, or only one may be used. The operation is as follows:—the smoke and heated vapours arising from the combustion of the fuel passes from the fire-place, A, along the several tubular flues, C, C, intersecting the boiler, and after parting with the greater portion of caloric to the salt water, makes its exit by the

chimney, c. The flues should at all times be covered with salt water, and have proper apertures and doors for cleaning them out. The steam arising from the ebullition of the sea water passing up the tube, *d*, through a perforated plate, and descending by the hood or cap, *e*, enters the steam-chamber, c, and, after parting with the greater portion of its caloric to the cooking vessels, *a*, *a*, passes off in the form of distilled water and steam by the pipe or passage, *f*, into the worm-head, *g*, which is surrounded with the cold water in the condenser, D. The remaining uncondensed steam vapour and hot water passing down the coiled worm, *h*, *h*, become refrigerated, the distilled water making its exit at the cock, *i*. The air pumps or bellows for forcing a blast of hot air into the salt water in the boiler, may be of any suitable constrnction and placed in any convenient situation; those I prefer are cylindrical bellows made of leather and wood in the ordinary way and they may be worked in any convenient manner. In the arrangement shewn in the drawing they are worked by a winch-handle, *k*, which by means of the crank, *l*, and connecting-rod actuates the cross shaft, *m*, which gives motion by means of the short lever, *n*, and its connecting-rod to the cylindrical bellows in the case, E. The blast of air passes from the bellows by the pipe, o, into the hollow grating or fire-bars, *p*, of the furnace, and after being heated in its passage by the ignited fuel on the bars goes off by the pipe, *q*, and is discharged into the sea water near its end, the bore or apertures being plugged up or closed, and the end of the pipe is pierced with small holes, the better to distribute the air into the water. The tube, *q*, is carried upwards into the pipe, *d*, to prevent the escape of the sea water out of the boiler by the pipe, o, when the bellows are not at work. The hot air thus blown into the water rises through it in the form of bubbles with the steam, and greatly increases the ebullition and evaporation, the steam-air and condensed water passing together into the refrigerator, as

before stated. V, is a reservoir for supplying the condenser with cold water for refrigeration, but they may be filled through a funnel placed at the top part, or by a pipe connected with pumps, or in any other convenient manner; the cold water enters the lower part of the condenser by the pipe, *r*, and rises up to the top part, where it becomes warm, and is drawn off by the pipe, *s*, to supply the boiler B, as required. When the water in the condenser becomes too hot for refrigeration it can be drawn off by the pipe, *t*, and fresh supplied from the reservoir, or a continuous stream of cold water may be made to pass through the condensers, if desirable. I would here remark that the boiler or steam-generator need not be divided into two parts, A and B, as shewn in the drawing, but that the boiling water may be allowed to touch or surround the cooking vessel, *a*, *a*, the steam and vapor being collected in a still-head or hood, with its exit-pipe connected to the worm-head, *g*, as shewn by the red lines in fig. 3, of the drawings. The distilled water as it comes from the apparatus is collected in barrels or suitable vessels, and to each twenty-five gallons of the distilled water a small quantity of sulphuric acid (say about a quarter of an ounce) is added, and with it about eight or ten ounces of broken charcoal, which is to be left in the water twenty-four hours, and during that time cold atmospheric air is to be blown or forced into it by bellows or other convenient means, the intention being that the charcoal shall remove the disagreeable flavour, or what may be called the vapid or dead taste which distilled water generally has, and the air impart more oxygen to the water, and the sulphuric acid give it a more agreeable flavour, and make it taste to the palate more like fresh spring water, the process restoring what may be called its aeriated or vital qualities, which it has lost in the operation of distillation. In conclusion, I would remark, that the blowing or forcing hot air into the water greatly increases the evaporation thereof, and produces steam more rapidly, and therefore economises

the consumption of fuel, and is applicable to generating steam for working engines for exerting power, warming buildings, drying goods, and various other purposes to which it may be applied.—In witness whereof, &c.

Enrolled August 23, 1836.

Specification of the Patent granted to John Houldsworth, *of Glasgow, in the County of Lanark, Cotton Spinner, for certain Improvements applicable to Drawing and Slubbing Frames used in the Manufacture of Cotton and other fibrous Substances.*—Sealed December 9, 1835.

WITH AN ENGRAVING.

To all to whom these presents shall come, &c. &c.,—*Now know ye*, that in compliance with the said proviso, I, the said John Houldsworth, do hereby declare that the nature of the said invention consists in the application and adaptation of certain machinery or apparatus to drawing and slubbing frames, used in the manufacture of cotton and other fibrous substances, for the purpose of stopping the action of such machines so soon as any one or more end or ends of cotton or other fibrous substances shall break or cease to be supplied to the machine; and the manner in which the same is to be performed and carried into effect will be seen by reference to the annexed drawing, and the following description thereof:

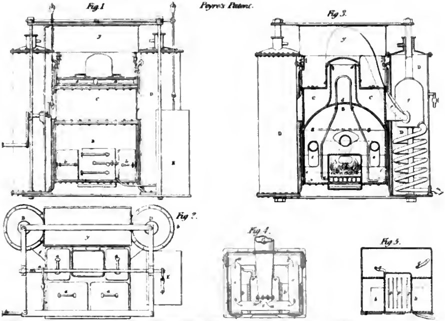
Description of the Drawing.

In this description it will be remarked that any part of the machinery which is referred to by a letter of reference is indicated by the same letter of reference in each of the various views and sections where such part is represented.

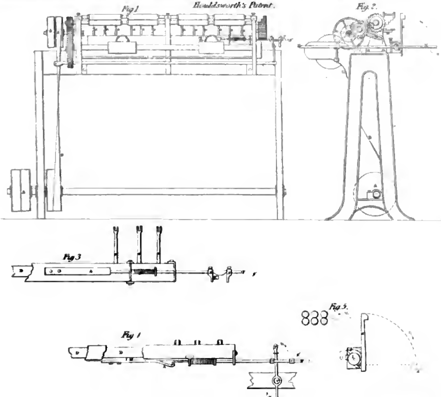
In the drawing, fig. 1, represents a front view; and

Fig. 2, an end view of one description of drawing frame

Peyre's Patent.



Houldsworth's Patent.



London, Published by Hodgson, 112 Fleet Street, December 1st 1836

used in the manufacture of cotton, to which the improvements are applied; and

Figs. 3, 4, and 5, are views and sections on an enlarged scale of the apparatus or machinery in which the improvements consist. In figs. 1 and 2, A, represents the driving pulley of the machine which receives motion from any adequate power; and B, is a strap or belt conveying motion to the fast pulley, *b*, or to the loose pulley, ^1b, according to the position in which it is placed by the strap guider, C. The drawing rollers and various other parts of the machine which are common to ordinary machines of this class, being no part of the invention, require no particular description. In figs. 1 and 2, *a*, represents a series of guides through which the sliver of cotton or other fibrous material is passed previous to its arrival at the drawing rollers. These guides, *a*, are respectively supported on small studs on which they vibrate in the direction indicated by dotted lines, and an arrow at figs. 2 and 5. D, is a shaft supported at each extremity and passing along the back of the drawing frame; this shaft, D, is allowed to revolve freely and is provided with a rib or mid-feather, *d*, on one side, and a projection or finger-piece, *e*, on the other side, and the relative position of these parts, *d* and *e*, will be best seen on an enlarged scale at figs. 4 and 5. Returning to figs. 1 and 2, E, represents a horizontal lever moving on its fulcrum at *f*, one extremity of which lever is connected with the strap guider, C, and the other held and guided by forks, *x*, proceeding from the under side of the sliding rod, F, as best seen in the detached parts represented at figs. 3 and 4. The traverse or end motion of this sliding rod, F, is indicated by dotted lines, and the spiral spring, *g*, with which it is provided gives it a constant tendency to move in the direction of the small arrow towards the point indicated at, ^1g. The opposite end of the rod, F, to that at which the letter, ^1g, is placed, is returned, or has a small projection, as seen at figs. 3 and 4, where, *h*, represents a spring

catch pressing in a notch on the slide rod, F, and holding it in the position there represented; but as soon as this spring catch, *h*, is forced back and the slide rod, F, relieved, the spiral spring, *g*, carries it to the point indicated at ¹*g*, and consequently vibrates the lever, E, in the direction of the arrow and dotted lines at its extremity at fig. 4. Having described the property and action of the various parts in which the improvements consist, together with the position and manner in which they are applied to one description of drawing frame, I shall now proceed to describe the effect of their combined action by means of which the machine is stopped so soon as one or more end or ends break or cease to be supplied to the drawing frame. Supposing, therefore, the driving strap, B, placed on the fast pulley, *b*, as represented at fig. 1, and the machine to be in action, a regular supply of cotton or other fibrous substance will be drawn forward through the respective guides, *a*, by the action of the drawing rollers, and this constant drawing action of the cotton or other substance will, by its friction, draw forward the series of guides, *a*, to the bearing, as seen at figs. 1, 2, 3, and 5. But supposing one of the ends to break, or the supply of cotton or other fibrous substance to cease, the guide through or over which such end passes to the drawing rollers, being no longer held up by the friction of such end, will, by its gravity, vibrate or fall to the position shewn in dotted lines at, *a*, figs. 2 and 5. In this position the opposite end of the guide, *a*, to that at which the cotton or other fibrous substance had passed through strikes against the mid-feather or rib, *d*, and revolves the shaft, D, to a position in which the projection or finger piece, *e*, strikes against the spring catch, *h*, and forces it back, as represented in dotted lines at fig. 5. The slide rod, F, being relieved by the spring, *h*, which is thus forced out of the notch, the spiral spring, *g*, immediately forces the rod, F, to the point, ¹*g*, as seen in dotted lines at figs 1, 3 and 4, and vibrates the horizontal lever, E, to the position indicated in dotted lines at ¹E, in

fig. 4. The strap guider, C, being thus carried by the lever, E, with which it is connected, will traverse the strap, B, from the fast pulley, *b*, to the loose pulley, ¹*b*, and stop the machine as required. It will also be seen by referring to figs. 1 and 3, that there is sufficient space between the forks, *x*, *x*, or projections from the rod, F, to vibrate the lever, E, by hand, when required, and thereby traverse the strap, B, into the loose pulley, and stop the machine. But when the machine is in action, and all the ends up, the rod, F, must be placed by hand in the position seen at figs. 1, 3, and 4, and the lever, E, in the position to keep the strap, B, on the fast pulley, *b*, where it is held by a small swell in the fork, on the under side of the rod, F, as seen at figs. 1 and 3. From the foregoing description, the advantages arising from the application of these improvements to drawing frames, used in the preparation of cotton for spinning (inasmuch as the machine requires less attendance, and stops as soon as an end breaks, or the supply ceases), will be readily seen by spinners and persons conversant with the subject, and although the application of the improvements to other drawing and slubbing frames, may require some variation in the construction and arrangement of the parts, yet such variation and arrangement must greatly depend on the build and construction of the machine to which the improvements are to be applied, and will be readily effected by any competent mechanic. Having now described the nature of the improvements, and the manner in which the same are to be performed and carried into effect, together with the mode of applying the same to one description of drawing frame, I wish it to be understood, that I do not claim any of the separate or well known parts of such machines or apparatus. But I do claim the construction and arrangement of apparatus, or machines, set forth and described at figs. 3, 4, and 5, of the drawing, as applied to drawing and slubbing frames, used in the manufacture of cotton, and other fibrous substances, for the pur-

poses already explained; and, I further claim any modification of such invention, by which the friction arising from the motion of the cotton, or other material, supplied to drawing and slubbing-frames, used in the manufacture of cotton and other fibrous substances, may be made to suppott a lever weight or other implement, which lever weight or other implement shall cause the machine to stop so soon as the friction or support of such cotton, or other fibrous substance, shall cease to exist; and which invention having never before, to the best of my knowledge and belief, been used within that part of His said Majesty's United Kingdom of Great Britain and Ireland, called England; his said dominion of Wales, or town of Berwick-upon-Tweed; I do hereby declare this to be my specifiation of the same, and that I do verily believe this my said specification, doth comply in all respects, fully and without reserve or disguise, with the proviso, in the said herein-before in part recited letters patent contained. Wherefore, I hereby claim to maintain exclusive right and privilege to the said invention.—In witness whereof, &c.

Enrolled 9th June, 1836.

Specification of the Patent granted to Andrew Parkinson, *of Low Moor, in the County of Lancaster, Overlooker of Power Looms, for an improved Stretcher, to be used in or with Hand or Power Looms.*—Sealed March 29, 1836.

WITH AN ENGRAVING.

To all to whom these presents shall come, &c. &c.,—*Now know ye,* that in compliance with the said proviso, I, the said Andrew Parkinson, do hereby declare that the nature of my invention of an improved stretcher, to be used in or with hand or power looms, consists in the construction and application of an apparatus or mechanical arrangement substituted for the ordinary temple or stretcher

used in both hand and power looms; and by the use and application of which, the amount of attention required from the operative or attendant on any loom or number of looms is greatly decreased, inasmuch as the speed or action of my improved stretcher is regulated and adjusted by and according to the progressive motion of the cloth or web in its progress through the loom, without the intervention or aid of the operative; and the manner in which the same is to be performed and carried into effect will be clearly seen by reference to the annexed drawing, and the following description thereof.

In the several figures contained in the annexed drawing, the same letters and figures indicate the same parts throughout the whole of the figures. Before I proceed to describe the manner in which my invention may be performed and carried into effect, I shall briefly state the nature and office of the ordinary stretcher or temple used in or with hand or power looms, for the purpose of making the application and utility of my invention better understood. The temple or stretcher used in or with ordinary looms is an implement which has been variously constructed, but generally consists of a jointed rod or shaft of wood, provided with small points or pins at each extremity. These points or pins are placed in the selvage or edge of the cloth by the operative or attendant, by whom the jointed rod is then forced into a straight position, and the cloth thereby held at a uniform width as it proceeds towards the cloth-beam. As the process of weaving proceeds, and the cloth is taken up on the cloth-beam, the stretcher or temple must be removed or shifted back, and this occasional removal of the temple or stretcher constitutes one part of the occupation of the operative or attendant on the loom. To produce an uniform width of cloth, or what is generally called a good selvage, great attention must be paid to the occasional removal of the temple or stretcher; and it is obvious that when the stretcher or temple moves along with

the cloth, as it does in ordinary cases, it cannot long remain in the most efficient position for performing its office. To obviate these difficulties which present themselves in using the ordinary stretcher or temple, and to render the action of the temple or stretcher independent of the assistance of the operative, is the object of my invention, which I shall now proceed to describe with reference to the annexed drawing.

Description of the Drawing.

Fig. 1, represents a front view ; and

Fig. 2, a plan or bird's-eye view of a description of loom in common use. In these figures A, represents the cloth-beam on to which the cloth is received as it is woven and produced; and B, is the stationary breast-beam over which the cloth passes previous to its arrival at the cloth-beam. The position in which the ordinary temple or stretcher is placed on the cloth is indicated by the dotted lines, *b*, *b*, seen across the cloth at fig. 2, and the position of my improved stretcher is seen at C, in figs. 1 and 2, where the improved stretchers, tinted red in the drawing, are firmly attached to the breast-beam, B.

Figs. 3, 4, 5, 6 and 7, are various views, sections, and detached parts of my improved stretcher at full size. Fig. 3, is an elevation, and fig. 4, a plan of a circular disc or wheel, having a levelled face, from which projects a series of small pins, which deflect obliquely both from the radius of the wheel and from the plane of its levelled face. This revolving or moving disc is placed on a stud, *m*, on which it moves freely, the position of which is best seen in section at fig. 5. The stud, *m*, on which the revolving disc is placed, is attached to or forms a part of the metallic piece, *a*, *a*, *a*, *a*, the external shape and construction of which will be seen in elevation and plan at figs. 6 and 7, which figures represent the improved stretcher in a complete state, and ready to attach to the breast-beam, B, of the loom, in or with which it is to be

used; and the internal construction of this piece, *a, a, a, a,* will be seen in section at fig. 5. On reference to fig. 7, it will be remarked that this part is provided with a slot, cut, or opening, through which the edge or selvage of the cloth in manufacture passes, such edge or selvage being indicated by the line, *c, c,* in fig. 7, and the same letters in fig. 2, which represent the cloth and position in which the improved stretcher is placed. In this position the pins with which the circular discs are provided (as already explained) pierce and insert themselves into the cloth, and from their oblique position hold it in a stretched and extended form, similar to an ordinary stretcher or temple, at the same time that the progressive motion of the cloth, as it passes towards the cloth-beam, revolves the disc, so as to present a regular succession of points, and thereby continuously hold the cloth in the extended and stretched position, to make the uniform and good selvage which is required. The hold of the pins on the selvage is preserved and secured by the cap or hood under which the attaching part of the wheel passes in its revolution, and on the cloth passing from under this cap the inclination of the pins permits the cloth to escape from their hold, and pass onward to the cloth-beam.

Having thus described my said improved stretcher, I declare that I do not claim as of my invention the employment for the purposes aforesaid of a revolving disc or wheel with pins, for laying hold of the cloth or web in the loom, otherwise than in combination with such a hood or cap, furnished with a slot, as I have hereinbefore described, for guiding the selvage of the cloth or web uniformly and accurately to and from the pins, and preventing its premature escape therefrom in the manner I have described. But I do claim the entire instrument, including a hood or cap, furnished with a slot, as hereinbefore set forth, as together forming the improved stretcher which I claim as my invention.—In witness whereof, &c.

Enrolled September 17, 1836.

Specification of the Patent granted to William Preston, *of Sunny Side, in the County of Lancaster, Operative Calico Printer, for certain Improvements in printing of Calico and other Fabrics.*—Sealed *April* 28, 1836.

WITH AN ENGRAVING.

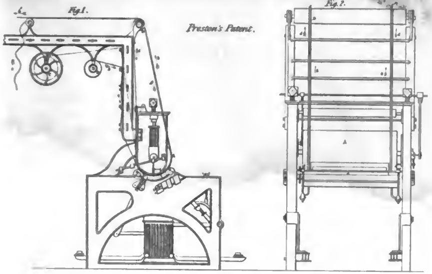
To all to whom these presents shall come, &c. &c.,—*Now know ye,* that in compliance with the said proviso, I, the said William Preston, do hereby declare the nature of my said invention to consist in a new arrangement of the blanket used in cylinder printing machines, by which the wear and tear of such blanket, in proportion to the amount of goods printed, is greatly diminished, and the manner in which the same is performed and carried into effect is shewn in the annexed drawings, and the following description thereof. The scale to which the annexed drawings are made is marked thereon, and similar letters and figures of reference are used to indicate similar parts throughout the whole of the drawing.

Description of the Drawings.

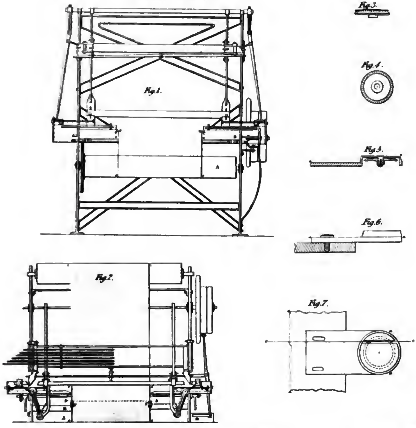
Fig. 1, in the annexed drawing represents a side view: and,

Fig. 2, a front view of a two-coloured cylinder printing machine, in which many of the ordinary parts are delineated for the purpose of shewing the position and mode of applying my certain improvements in printing of calico and other fabrics. In figs. 1 and 2, A, represents the ordinary bowl, which is provided with lapping, and *a, a,* the two cylinders from which the impression is received on the surface of the calico or other fabric in the process of printing. The course of the calico or other fabric is indicated by small arrows, marked *b, b, b, b,* proceeding from the roller, B, under the bowl, A, and forward to the drying-stove in the direction of the arrow,

Preston's Patent.



Parkinson's Patent.



London. Published by Hebert, 88, Fleet Street, December 1st 1838.

b. Between the calico or other fabric to be printed and the blanket, is passed a grey piece of calico, or similar cloth, which is rather wider than the piece to be printed, for the purpose of defending the blanket from the impression from the printing cylinders, *a*, *a*. This grey piece is placed on the roll, c, and proceeds forward in the direction of the arrow, *c*, *c*, *c*, *c*, to the arrow, '*c*, where it is either deposited on the floor, or carried forward to the stove, and dried as occasion may require. Immediately in contact with the lapping on the bowl, A, and under the grey piece, c, is placed the endless blanket, *d*, *d*, *d*, *d*, which passes over the revolving cylinder, D, by which it is adjusted and held at the required tension, and the direction in which this blanket moves when the machine is in operation is also indicated by small arrows.

Having described the arrangements of the various parts by which my improvements in printing of calico and other fabrics are carried into effect, it will be remarked, that one essential difference between the arrangement described and the ordinary arrangement of printing machines of this nature, is, that the blanket, D, is much shorter than an ordinary blanket, and that it does not at all enter into the drying stove. The grey piece, c, may or may not be carried through the stove, according to the nature of the colour used in the printing process, some of which would be injurious to the fabric if subjected to the heat of the stove. But this, and similar minor arrangements, are well known to printers and persons conversant with the subject, and must depend on the judgment of the parties to whom such machine is intrusted.

I shall now proceed to point out some of the advantages gained by the application of my improvements. In the first place, the blanket not passing into the stove does not impart heat to the printing cylinder, which is known in practice to be considerable in the ordinary arrangement, and to present difficulties which this arrangement obviates; at the same time that the whole of the power

required for moving an ordinary blanket, together with the oil and the wear and tear of rollers in the stove through which the blanket passes are entirely saved. And moreover I have found that by the use of a grey piece of calico, or other similar material, I am enabled to run the short blankets, D, set forth and described in the foregoing specification, to a much greater extent, or, in other words, to print a much greater amount of goods from the same amount of blanket than has been heretofore effected in the ordinary processes, where the blanket is subjected to the heat of the stove.

Now, although I have described, in reference to the annexed drawing, several ordinary and well known parts of the printing machinery in common use, for the purpose of making the nature and mode of application of my invention better understood, yet I do not claim any such well known parts as of my invention, or the use of a grey piece between the blanket and the fabric to be printed; but what I do claim as my invention, is the novel arrangement of the blanket, D, which effects all the purposes of an ordinary blanket without passing into the drying stove, in conjunction with the use of the grey piece, C, which combination of parts being new, and never before used in that part of His Majesty's kingdom of Great Britain and Ireland called England; and this my specification complying, as I fully believe in all respects, fully and without reserve or disguise, with the proviso in the said hereinbefore recited letters patent contained, I do hereby claim to maintain exclusive right and privilege of my said invention.—In witness whereof, &c.

Enrolled September 30, 1836.

Specification of the Patent granted to FRANZ MOLL, *of Grove Terrace, Camberwell, in the County of Surrey, Esq., for certain Improvements in preserving certain vegetable Substances from Decay.*—Sealed January 19, 1835.

To all to whom these presents shall come, &c. &c.,—*Now know ye*, that in compliance with the said proviso, I, the said Franz Moll, do hereby declare the nature of my invention, and the manner in which the same is to be performed, are fully described and ascertained in and by the following description thereof, (that is to say):

My invention of improvements in preserving certain vegetable substances from decay, relates to preserving timber or wood from decay, or from the effects of what is called dry rot, and my invention consists in submitting such substances to the action of certain products of tar, called "eupion" and "kreosot" when in a heated state, and in the form of vapour, as will be fully described hereafter. And in order that my invention may be fully described and readily carried into effect, I will proceed to describe the process I have pursued and have found fully to answer in preserving timber or wood from the destructive effects of what is called dry rot.

Description of the Process.

I take any quantity of coal tar and place it in a still, such as is commonly employed for distilling coal tar, filling such still to about two-thirds of its capacity, and gradually apply heat till a vapour passes over, which is to be condensed by an ordinary refrigerator, such as is usually employed in distilling tar, and permit this process to continue till the product condensed becomes nearly of the specific gravity of water. This first product, when pure, has for some time been called by German, and is now so called by English chemists, "cupion:" and al-

though by such single process of distillation the product thus obtained cannot be said to be pure, I will, notwithstanding, call it eupion, it being in most cases sufficiently pure for the purpose of my invention, though it should be stated that it sometimes will be found to contain acid, which will readily be ascertained by litmus-paper, or other well known tests, and in such cases I submit it to the action or washing of lime water; in case that, for economy's sake, it would not be feasible to take it to a higher degree of purifying by the means of the application of acids, and washing with alkali leys, and re-distillation, very recommendable operations to the effect of mending the original smell of the eupion or kreosot which, in such cases, might be desirable. The first product of eupion thus obtained (and treated with lime water if necessary), is to be permitted to stand when the eupion will float on tbe surface of any water which has been distilled over with it, and also on the lime water if used, and the same may be drawn off separate. The eupion will then be fit for use. In order to obtain the second product from the coal tar remaining in the still, the same is to be heated to a higher temperature, till a vapour comes freely over, which is to be condensed as the former one; this operation may be carried on till only pitch remains in the still. The second product thus obtained is when pure, now called *kreosot*, both by English and German chemists; and although such product cannot be considered pure by one distillation, it is sufficiently so for my invention. This second product is also to be tested, in order to ascertain whether acid is present, and if such be the case, it is to be submitted to the action of lime-water, as described with respect to eupion. Some chemists have found it beneficial to mix carbonate of lime with the tar, in order to free the eupion or kreosot from acid at once at the same time they are produced. This second product, or kreosot, when separated from lime-water, if it has been used (which separation will readily be effected,

as the water will part from the kreosot, and may be drawn separate therefrom), will than be ready for use. I would here remark that these two products, eupion and kreosot, may be obtained from other than coal-tar, and it may be desirable at once to state that I lay no claim to any process of obtaining these two products, the same forming no part of my invention, and have been before performed by other persons for various purposes. The timber, or other vegetable substance to be operated on, is to be placed in a close chamber, which may be of iron or other suitable material, care being taken that the same is so well constructed as not to permit of the escape, unless desired, of the vapours of the eupion and kreosot, the shape of such chamber not being material, but must be adapted to the nature of the timber or wood which is to be operated on, at the same time the interior is to be so arranged that the timber or wood may be acted on in every direction by the vapours, when the same is permitted to flow into the chamber; and it is preferred that the timber or wood should stand vertically, where the height of the chamber will allow of that position. The chamber which is to contain the timber or wood is to be heated by means of steam-pipes, or otherwise, in order to keep the same, when the process of seasoning is being performed, at a temperature at which the eupion and kreosot may be maintained in a state of vapour. The chamber is to have a pipe leading to a condenser, by which the vapour may be permitted to flow to prevent the same becoming of too high a pressure within the chamber, such pipe having a valve which may be acted on by hand or by the pressure of the vapour; but it should be remarked that it is not desirable to have any more considerable pressure of the vapour in the chamber than consistent with the texture of the timber. In order that my invention may be more clearly understood, I I will suppose that I am going to operate on several pieces of timber, and that they are placed in a chamber

sufficiently large to leave a space all around them, and that there is also a space all around each piece of timber. Into this chamber, which at commencement should be heated to about 90° to 100° of Fahrenheit, in order to warm the timber or wood, and render it more fit for receiving into its pores the vapours of the two products, eupion and kreosot, such heat being continued progressively to increase till it arrives at a sufficient heat to assist in maintaining the products in a state of vapour. Things being in this position, and the water that may have flowed from out the pores of damp timber drawn off, eupion is to be placed in a still from which a pipe proceeds to the chamber; and should the same be extensive, it is desirable the pipe from the still should have several perforated branches, in order to the vapours passing freely into various parts of the chamber, at the same time heat is to be applied to the still, and vapours of eupion will rise therefrom and pass into and pervade the chamber; and such is the nature of the eupion, that it will quickly enter into the pores of the timber which is inclosed in the chamber; and it should be stated that the chief object in thus first submitting the timber to the action of the eupion, is with a view to facilitate the entry of the kreosot into the pores, which, from the affinity that those two products so circumstanced have to each other, will very materially assist in performing my invention, which chiefly consists in impregnating the vegetable substances with eupion and kreosot, for preventing vegetable substances being liable to decay after the process is performed. Having continued the process of applying eupion vapour to the timber in the chamber till it is considered sufficiently prepared for the future process, the eupion vapour is to be shut off, and the eupion that may be found condensed in the chamber is well drawn off, and vapour from a still containing kreosot is to be permitted to flow into the chamber in like manner to that described with reference to the vapours of eupion, and this process is

to be continued for some time, when the chamber is, when thought necessary, to be filled up with hot kreosot in its liquid state, so that the kreosot will cover the whole of the timber in the chamber; and in this state things are to remain for some time, when the timber is to be removed, and may either be at once used, or be stowed away for future use. It should be remarked, that owing to the difference which is found in woods, even those known by the same name, no positive rule can be laid down as to the time which any particular timber or wood should be submitted to the operation of the eupion or kreosot, at the same time it should be stated that a very little practice will soon enable a workman to judge of the time to allow for each process, according to the description of wood which is to be operated on; and in order to convey the best information in my power on this part of the subject, I will state the particulars of an experiment made by me on a balk of good oak, which was rather in a damp condition; the same was fourteen inches square, and about ten feet long, which, on being submitted to the vapour of eupion for about six hours, when cut in two parts, was found to be impregnated proportionally even to the heart with eupion, and when the two parts were afterwards submitted to the vapour of kreosot and boiling kreosot, the same was found to have taken full effect within two hours; but such experiment was conducted under the disadvantages of an indifferently arranged apparatus.

From the foregoing description, an intelligent workman will readily be able to perform my invention, and will construct his apparatus according to the nature of the articles to be operated on; and I would further observe, that ships or vessels when built may, in a great measure, be preserved by closing all parts, and filling them with the vapour of eupion and kreosot in the manner described for filling the chamber; and the operation will be facilitated if steam pipes or other means can conveniently be

resorted to for keeping the internal parts of the ship or vessel heated, in order to retain the eupion and kreosot as much as possible in the state of vapour during the operation; by this means the wood of which the vessel is constructed will be impregnated with eupion and kreosot, and hence be preserved from dry rot; and in order as much as possible to save expense in performing the process in ships or vessels, it will be desirable to place timber requiring to be operated on in the hold of such ship or vessel, by which means the same will be heated or prepared at the same time the vessel itself is being operated on. I would remark, that I am aware that coal and other tar, purified or raw, have been before used for coating wood or timber for the purpose of preserving the same, but by such operation the same effect is not obtained as that which results from applying the two products of the coal tar as herein described. When coal or other tar is used for merely coating wood or timber, the products, eupion or kreosot, do not separate from the pitch and penetrate proportionally to the heart of the timber, and without that being the case, but little advantage results from such an application of tar. Where it is not thought a matter of importance whether the timber be chiefly penetrated with kreosot or eupion, the former of which I consider the chief agent against dry-rot, or where the operation is chiefly performed in order to prevent the effects of penetration of water into the wood, or where it is judged no matter whether these fluids convey any acidity into the timber, and when the proportion of eupion or kreosot contained in the tar is well known, and judged the proper one, according to the nature of the timber to be prepared, the operation may of course be much simplified by letting the vapours of tar or other matter containing eupion or kreosot, or both, enter the timber as well as they may; but I am bound to state that the above described method of washing the substances and applying them separately will be found far superior in use, as the

volatility of eupion and its fluidity will allow its very rapid penetration into the timber more perfectly than when in combination with the kreosot, whose entrance the former will greatly facilitate when once lodged in the pores, through the affinity of the two substances; and as by this means I am master over the quantity of eupion I will allow to be absorbed by the wood; moreover the antisceptic power of the kreosot will be augmented by the washing and freeing it from other matters mixed with it.

Having thus described the nature of my invention, I would have it understood that what I claim as my invention is the impregnating the vegetable substances, timber or wood, with the products of tar, or other material containing such products, which are here called eupion and kreosot, and thus preserving the same as above described.—In witness whereof, &c.

Enrolled July 19, 1836.

LAW REPORTS OF PATENT CASES.

In the Common Pleas. Thursday, February 25, 1836.

MACKINTOSH and others *v.* EVERINGTON and others.

(*Concluded from page* 328.)

Richard Phillips, Lecturer on Chemistry at St. Thomas's Hospital.

Examined by *Mr. Serjeant Bompas.*—I have seen the specification of plaintiff's patent, and have carried through the process as there described; it is such a specification that I clearly understood the mode in which the invention was to be performed: I have had coal-oil for several years; it is well known in commerce by that name. I sent to Mr. Cassell's Works, Mill Wall, Poplar, for some; he prepares this oil and purifies it. I am not personally acquainted with Mr. Cassell. The coal-oil I obtained from him, was similar to what I had before used. Coal-oil is an extremely volatile substance; its nature is not

at all changed by re-distillation; it is more volatile than coal-tar: if mixed with coal-tar it can be separated by re-distillation. Coal-oil is lighter than ammoniacal liquor. I tried some experiments according to Clarke's receipt in proportions of the substances that were given to me; viz., one ounce of caoutchouc, eight ounces of spirits of turpentine, and seventy ounces of linseed oil; the effect of the linseed oil, on heat being applied, was to decompose the India-rubber. I put the India-rubber in a different vessel, and then immersed the vessel in oil, and heated the oil, and exposed the India-rubber to the temperature of the heated oil. I found it had undergone a great change. The India-rubber which was in the oil underwent a similar change. I find that India-rubber, partly decomposed, becomes nearly as tenacious as bird-lime, and cannot be again restored to India-rubber. This experiment was fairly made according to Clarke's direction. I received a piece of a cloak, bought by the last witness; I can see no difference between it and Mackintosh's. It is double texture, and India-rubber is used in the same manner as Mackintosh's. I put the piece of cloak into coal-oil, and it dissolved the India-rubber which was with it; I got the India-rubber from it, and I am satisfied that the cloak had been made with a solution of India-rubber. The materials in my judgment are precisely the same.

Cross-examined by *Mr. Serjeant Wilde.*—I think I knew the article coal-oil very soon after the patent was granted.

John Thomas Cooper, Professor of Chemistry sworn. Examined by *Sir William Follett.*—I have seen the plaintiff's specification; I tried to manufacture articles there described according to the specification; I proceeded entirely according to the process therein mentioned. I succeeded perfectly in making the articles impervious to air and water. I used coal-oil, which I obtained at Mr. Cassell's, to dissolve the India-

rubber. Coal-oil is well known; I have known it for fifteen to seventeen years at least; I have seen it at gas works floating on the surface of the ammoniacal liquor; I tried that with the caoutchouc, according to the mode described, and the varnish so produced was equally effective for making fabrics water and air proof. The coal-oil was not re-distilled, it was just from off the ammoniacal liquor; that oil is made pure by repeated distillation; it is not necessary to have a larger quantity of it to produce the effect, but it requires a greater quantity of crude oil to dissolve the same quantity of India-rubber; I call it crude oil, to distinguish it from the oil that has been re-distilled. The effect is the same, except that it makes the fabric a little more stiff, in consequence of the other matter it contains. The purer the oil the better, so says the specification. The mode of purifying the oil is so well known to chemists, it does not require very deep science to know how to do it, nor any direction in the specification; any person at all acquainted with the subject would know how to do it.

Cross-examined by *Mr. Serjeant Wilde.*—I distilled coal-oil seventeen years ago; it was obtained at that time in small quantities from the surface of gasometer-tanks.

George Lowe sworn. Examined by *Mr. Watson.*—I am a Fellow of the Royal Society, and have been for the last fourteen or fifteen years engineer to the Chartered Gas Company. Coal-oil is produced in making coal-gas; it floats on the surface of ammoniacal liquor. This is a specimen of the coal-oil produced in the company's works at Brick Lane, in one of the gasometers; there cannot be less at this time than from 100 to 150 gallons of this volatile oil. I dissolved India-rubber with that coal-oil. In the year 1823 this substance was called coal-oil, volatile oil, and spirits of tar; it had various names; it was known as coal-oil then, but of late years more as naphtha.

Cross-examined by *Mr. Serjeant Talfourd.*—A greater or less proportion of the coal-oil can be obtained in gas works according to the circumstances under which the process of condensing or cooling the gasses is conducted.

Re-examined by the *Attorney General.*—There is always a considerable product of the coal-oil in gas works, independent of any peculiar means of condensing, in addition to that which may be in combination with the tar. I should say the supply altogether, speaking within moderate bounds, would be at least 3000 gallons per week of the coal-oil from the first distillation of the coal in this country.

Alexander Gardener sworn. Examined by the *Attorney General.*—I am a practical chemist; I have read the plaintiff's specification, and think there can be no difficulty in making the fabric from the direction there given; I never heard of a similar process previous to his patent; I have made experiments in accordance to the specification, and applied the dissolved India-rubber to fabrics, which made them impervious to water; I used two kinds of coal-oil; one I obtained from Mr. Cassell, the other I think from Mr. Blunt. I have known coal-oil ever since the introduction of gas; it is obtained in the distillation of coal, and is commonly called and well known by the name of coal-oil. I know the coal-oil in its crude state, as it is found after the distillation of the coal; I saw it at the time gas-light was introduced; I received the product from Mr. Winsor, the first introducer of gas. I have made experiments with coal-oil in its original form, and it answered equally well; when the coal-oil is evaporated, the India-rubber remains in its original form, and with its original properties.

Cross-examined by *Mr. Rotch.*—The specification directs that the substances that are to be united are to be stretched on frames before they are put together; I found nothing in my analysis that told me about coal-oil; that was impossible for me to tell. I found India-rubber

interposed between two fabrics, it appeared to me to resemble the invention described in the plaintiff's specification.

Re-examined by the *Attorney General.*—The substance before it has been re-distilled, and after it has been re-distilled, is still called coal-oil.

Edward Turner, Professor of Chemistry at the London University, and F.R.S., sworn. Examined by the *Attorney General.*—I am acquainted with the plaintiff's patent and specification; I knew of the invention when it was first made public in 1823; in my opinion at that time the invention was new. I am acquainted with the manufacture of coal-gas in a general way, and have visited many gas manufactories; I have known coal-oil for a number of years; I became familiar with such subjects about 1823. The specification appears to me to properly describe the process.

Arthur Aitken, Secretary of the Society of Arts, sworn. Examined by *Mr. Serjeant Bompas.*—I remember when the plaintiff's patent came out: according to my judgment, it was at that time a new invention; I never heard of any thing similar to it before. I know the substance called coal-oil, it is one of the products obtained in the manufacture of gas: if it is wished to be made pure the common mode of doing so would be distillation.

James Bowman Neilson sworn. Examined by *Mr. Watson.*—I have been manager of the Glasgow gas works eighteen or nineteen years. In making gas we have deposits of tar, ammoniacal water, and coal oil, and these subtances are separate and distinct. The first person who obtained it from our works was Mr. Mackintosh; before he took it we treated it as refuse.

George Halworthy Palmer, sworn. Examined by the *Attorney General.*—I am Manager of the Metropolitan Gas Works. Coal-oil can be drawn off without difficulty, being specifically lighter than the tar and ammoniacal liquor, and floats on the surface; sometimes when the

oil is taken immediately from the gas-mains it is in nearly as good a state of purity as that which has been re-distilled.

J. G. Children, Secretary of the Royal Society, sworn. Examined by the *Attorney General*.—I am acquainted with the plaintiffs' mode of making cloth water-proof and air-tigbt; as far as my knowledge goes it was perfectly new when first introduced at the time of the patent.

Cross-examined by *Mr. Serjeant Wilde*.—I never heard of India-rubber being applied to fabrics in tbe same manner as that described by the patentee previous to his patent.

Mr. Attorney General stated that that was the plaintiffs' case.

Mr. Serjeant Wilde addressed the jury for defendant as follows.—This is, undoubtedly, an important case both to the plaintiff and defendants as well as the public. My learned friend, on the part of his client, states that the plaintiff having been at great labour in discovering an invention of considerable value, there ought to be preserved to him an adequate remuneration for that labour by the exclusive manufacture and sale of the article now before us. I agree with him tbat in a case where an individual has *actually* discovered some useful invention by which the public are to be benefitted, he should be entitled by law to the exclusive sale of the articles patented; but, on the other hand, on behalf of trade in general, I maintain that an individual shall not, wben tbe subject is generally before the public, step in and, by an uncertain vague description, lay his hands on some useful manufacture reserving to himself not something be has discovered, but something which he hopes either he or some other person will discover, and which, when discovered, shall refer back to his patent. My learned friend says that various persons have been engaged in trying to accomplish the object of procuring water-proof articles sufficiently light and flexi-

ble to be useful, that the public were within a step of accomplishing this object, and that fortunately his client advanced that step. It is my case, that that step was not advanced by him. It had been known for years before the patent of Mr. Mackintosh, that India-rubber might be applied so as to render a fabric waterproof. If it is applied to the outside of garments it will be inconvenient and disagreeable, have a clammy appearance, and want renewing; if on the inside it will be still more disagreeable, being next the person. But Mr. Mackintosh says he will put a lining to it, and then get a patent for that, the solution that would render it waterproof is well known. In the specification he says he does not claim the solution, but what he claims is the putting two fabrics together, and as they are wanted to stick he presses them. This patent has no other object than putting two pieces of cloth together with a well-known solution of India-rubber between. He has put two things together and got a patent for it. Now, I say that the circumstance of his applying a known solution to a known purpose to produce a known result, clapping one piece of cloth over another cannot be the subject of a legal patent. I will read the specification of a patent granted many years since to a person of the name of Johnson, he says "take flock, such as you put on the paper of a room, and make a lining of that." The plaintiff says he puts a piece of cloth instead, and all the witnesses on his behalf, say, that they never heard of such a process before. The defendants are not manufacturers but deal largely in all articles of dress, and are glad to sell that for which there is most demand. The only evidence of the infringement is, that certain parties have effected the same object as the patentee, and the witnesses know of no other means than those which the patentee uses to effect that object. When the plaintiff comes on the ground of his having advanced one step, and claims to retain the exclusive right to sell this article, he is bound to make out a perfect

case. When the crown grants an exclusive right for an invention, it is granted upon certain conditions, and one express condition is, that the grantee shall, in consideration of that grant, which is for fourteen years, give the public the means of using the invention at the expiration of his patent, in the best manner that he can inform them in a specification, which he is required within a certain time to enrol. There is a class of patents which ought to be narrowly watched, in which there is a vagueness and generality in the specification; and there is in this case an intended vagueness and generality, in order to cover any thing which might be discovered by the plaintiffs, or any other persons. My learned friend, the Attorney General, says he claims for his client the exclusive right of selling a coat formed of two pieces of cloth, stuck together by an India-rubber cement. I say, the patent was intended to claim more than that; not only fabrics stuck together by India-rubber cement in a state of solution, but cloths stuck together by any flexible cement not limited to India-rubber. He gives you in the specification the solution that is to be used; he tells you that is the best mode he has found out; and if that statement is untrue, he has not fulfilled the conditions of the grant, and is not entitled to exclude the rest of the trade from participating with him. I will read you the specification, calling your attention to two points; first, whether it claims the putting of two pieces of cloth together by means of *any flexible cement*, or by means of a *flexible cement of India-rubber* in a state of solution only. And the second point is, what is the solution there described which is to produce the desired effect? The patentee says, "I claim a manufacture of two or more pieces of linen, woollen, cotton, silk, leather, or paper, or other the like substances, any or either, or any combination of any or either, the same cemented together by means of a flexible cement." This passage amounts to—I claim putting two pieces of cloth together by a

cement, that is the substance of it, "the nature of which said manufacture is, that it is impervious to water and air." I should be glad to know what you find about India-rubber there. There is but one object in the paragraph which I have read, and that object is to state what the invention is, and in it there is not one statement about India-rubber. What other cement could have been used that would not have fallen within it? None. Any flexible cement for the purpose of uniting two pieces of cloth together, and rendering them water-proof and air tight, would be within this patent. If I prove that Mr. Mackintosh knew a better mode of performing the invention, that he used a better, and that he never used the one he has described in his specification, then I shall prove an utter failure in the performance of his condition. In order to ascertain whether this was a *bonâ fide* disclosure, I questioned the witnesses how Mr. Mackintosh did it, but was stopped. He manufactured this solution in 1823, and has continued to do so to the present time, and we are to discuss whether he has disclosed the most useful mode of preparing it, which he was apprised of at the time, and for that purpose I was entitled to know how he now carried on the manufacture. He says in his specification, "I prepare caoutchouc by cutting it into very thin shreds or parings, and then steep it in the substance which is produced in making coal-gas, commonly called coal-oil; the quantity of these ingredients is extremely various."—That is, the quality of the substance produced in making coal-oil. Some part of it is found in the main; that is in a certain degree of purity. Other parts are found in the condenser; that is of a certain degree of impurity. Other parts are found pure, and therefore all varying in purity. "And the relative proportions to be employed must depend on the quality of each; but when the caoutchouc is of the best quality, and the oil pure, from ten to twelve ounces of the former to a wine gallon of the latter will be found to an-

swer." Now this is the best mode that Mr. Mackintosh has found of dissolving the India-rubber. [The learned serjeant here read the remainder of the specification.] Mr. Mackintosh says he claims the produce of certain results—the union of two fabrics by a cement, rendering it impervious to air and water. There are various modes of doing it; I will tell you one. He disclaims being the inventor of the solution; he only tells you the mode he has found best. It is by a solution of India-rubber; but does he confine himself to the cement by means of that solution? I submit he does not. I ask you if a person shall find another solution, or had found any other flexible cement by which he united two fabrics together, and rendered them impervious to air and water, whether Mr. Mackintosh would not have had a stronger argument to come here and say, my claim is expressed in the most distinct terms, the union of two fabrics by any flexible cement. You are unjust—you are applying critical acumen—you are improperly depriving me of the benefit of my patent, because I give you one species of cement which will accomplish the invention; and you seek to limit me to that one, though I told you it was not the only one, but the one which, according to my experience, I found the best? But to-day he cuts down his specification to the particular instance which is given as the best. "I do not mean any flexible cement, but only India-rubber." I cannot entertain a doubt that this was intended to apply to any flexible cement; at least it is very ambiguous, and would have been open to have been contended with an equal chance of success the one way or the other; and I shall therefore pray judgment, first, whether this is not a claim to the others which I have mentioned; and next, whether at least it is not so ambiguous and doubtful, so wanting in clearness in the mode of doing it, so uncertain in what he claims, as to be void? That is my first objection. Mr. Mackintosh has claimed more than he is entitled to—he has claimed for all flexible cements; and

he now shrinks from that, because he knows he cannot sustain his patent to that extent. But his specification is against him in this; and if it be ambiguous and doubtful, it is equally objectionable. My other objection applies to his conduct in regard to the solution. He was engaged in the preparation of a solution made from coal-oil before he obtained his patent, which process he then kept a profound secret, and conducted not on the premises where he manufactured the cloth, but on premises adjoining, with a separate entrance. He continued to prepare the solution till 1826, when he went to Manchester, where he now prepares it. But does he use that solution? No, nor ever did. What is the use of calling a chemist to produce half a sheet of paper, and to say we have done this from the specification. The deception of all this is, that a trifling experiment upon a limited scale, where expense is no object, is no test of the same thing on a large scale. Instead of calling the workmen where the contest is, if a particular article is applicable to a particular purpose, not a single workman is called to prove that a yard of this cloth was manufactured in the manner alleged, but for some purpose they call chemists to swear it could be done. What need of experiments where the thing has been carried into effect, and has become a matter of trade; if you want experiments, a hundred cloaks made from a certain number of gallons of coal-oil would be an experiment worthy of being submitted to your attention, but the plaintiffs cannot prove that they use the oil as it comes from the gas-works. What is the mode in which the solution is rendered applicable to the purpose? it is a secret; and when any is wanted for experiment, it is bought ready prepared at the dry-salters. If it is so easily obtained; why do not the chemists make it themselves? A witness has produced a specimen of cloth of his own make from India-rubber, solved with the crude coal-oil. Apply your nose to it. Now that is made from coal-oil in its natural state. Look at that

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article as a useable and saleable article, and compare it with the cloak purchased at the defendants, and tell me what would be the degree of competition which would prevail in the market, between the coat of that description and one made in the manner I have just shown you; don't let my learned friend talk of imperfect specimens, they are the best he could produce for his client; yet he has a factory of workmen, and could produce specimens of the best form. He cannot prove that he ever used a single ounce of the nasty liquid for the purpose of his manufacture. The specimens he produces are imperfect, offensive, and wholly unsaleable, which proves that he, when he said the best means he had discovered was the application of coal-oil as a solvent for the India-rubber, made a serious mistake. He says he told you it must be pure, and that you must know that to make it pure you must distil it; that is an odd word to apply to purifying. Can any man at this time make cloaks from the specification, so as to compete with either the plaintiff's or defendant's. Mr. Mackintosh does not even use the coal-oil that he can buy, he has discovered a mode of preparing the solution by distillation, or in some other mode so peculiar, that he keeps it a profound secret; he is a step in advance in one thing, that is, in having discovered a mode of making a solution, but the nature of that step he does not disclose, neither does he claim it as a part of his patent. When he talks of the oil being pure, if he meant that it should be distilled, why did he not say, take the articles and dissolve them in highly rectified coal-oil, that would have informed us at once what proportion does crude oil bear to highly distilled; they say, that the crude oil dissolved ten ounces to a gallon; what says the specification, "when the caoutchouc is of the best quality, and the oil pure, from ten to twelve ounces of the former to a wine gallon of the latter will be found to answer," giving the very quantity attached to the crude oil, not the quantity according to them, but

which, according to them, is eight ounces instead of ten, so that it shows Mr. Mackintosh knew well, if he could only lead persons to attempt to waterproof the cloth with coal-oil produced in making gas in its crude state, he was quite safe, not only during his patent, but ever after, as the article produced would be so nasty as to be perfectly useless and unsaleable. It is therefore clear that he intended to conceal the only article which could be usefully applied, and has concealed it to this very moment. The principle of this invention was well known before the plaintiff obtained his patent; I will show what has been its progress up to the point when my learned friend says his client got a step in advance. In Baron Humbolt's work published in 1819, called "Personal Narratives" of his travels, he says, "*In preparing the milky juices of the hevea and some other trees, there appears a striking analogy between the juices which abound, and those in the caoutchouc, and the impermeable cloaks manufactured in Spanish America, are made by placing a layer of milk of the hevea tree between two pieces of cloth.*" This is the caoutchouc as it comes from the tree in its natural state, and in the states to which it is most desirable to reduce it; if you can reduce India-rubber to a state similar to that in which it comes from the tree, the effect of its being put between two pieces of fabric is to render it waterproof: he also says, "*Placing a layer of the milk between two pieces of cloth, exhaled an animal and nauseating smell. Which seems to indicate that the caoutchouc, in coagulating, carries with it the casuem, which is perhaps only an altered albumen.*" I shall call a witness who will prove that, before the date of the patent, there was to be found in Demerara, in the store houses, cloaks made water-proof by India-rubber between two folds, and that such cloaks were publicly sold in Demerara; then, I ask, what is the invention of Mr. Mackintosh? I admit that if the India-rubber, being in the

state in which it exudes from the tree, could be used for this purpose, but coming here it changes to a state no longer fit and applicable, and that it requires art to restore it to its original state of solution. I admit that for the means of restoring it to its state of solution, and making it capable of being used for making fabrics waterproof, he discovering such mode would be entitled to a patent, but that is not what Mr. Mackintosh claims; he disclaims the solution and claims the putting India-rubber, while in a state of solution, between two cloths; the means by which it is restored from its altered state when dry, and exposed to the atmosphere in a state of solution, being out of the case, and no part of his patent. The tree is perfectly well known to those parties, for in the specification to a patent obtained by Mr. Hancock, in 1825, he says, "the liquid I have mentioned is brought into this country from certain trees which grow in South America." I shew a public document enrolled in the patent office, to prove that the nature and quality of this thing was well known. Couple these together: here are the juices of the tree as common India-rubber, here are the juices of the tree placed in a liquid state between two fabrics perfectly well known. The object is to evaporate and get rid of every substance but a thin layer of India-rubber, with as little of foreign matter as possible. I shall prove that socks were publicly sold, consisting of two pieces of fabric stuck together with India-rubber. Here is the principle of two fabrics united by a flexible cement, and that flexible cement is India-rubber, and nothing remains to distinguish it from the most perfect identity. But, my learned friend says, theirs is put in a state of solution, and the other entire. That which is introduced in addition to the India-rubber, for dissolving it, is but the vehicle to apply it, therefore it will be most material to shew that the whole principle of this patent was known. Here is an article joined together by a solution of India-rubber; it is part of Mr. Green's bal-

loon, which was broken at sea, I believe on the day of the coronation of George 4th. There you have the principle of uniting two fabrics by a solution of India-rubber, and that is the patent; and in a balloon, an invention made public enough, Mr. Green will tell you that he afterwards cut up the balloon and made cloaks of it, and gave them to his friends, who wore them. The patent is not for cloaks only, you must not make balloons, nor socks, nor any other article. Mr. Mackintosh will acknowledge that he used this known solution to produce this known effect, but will say that he used it in a particular manner, and that, therefore, he is entitled to his patent: the solvent as described he does not to this hour use. Does he use the brush? No. He applies the solution not in the manner stated in his specification, but he uses a gauge, and the cloth with the solution upon is passed under it, and is thus spread. This is a remarkable instance of a patentee coming into court and complaining that his patent has been infringed, and yet he is carrying on his manufacture by a mode wholly different from the mode described in his specification. Tell me whether the pressure that is applied is the same; whether the mode of spreading the solution is the same; or whether the mode of stretching is the same. I have never witnessed an instance where a man claimed so little, and of that little continued to use still less. The witnesses from the gas-works prove that he never, but in one instance, purchased the coal-oil separately, and it slipped out from several witnesses that naphtha was another name for coal-oil. The chemists tell you that they do not know how it is prepared. The evidence of chemists and the gas-works people is irrelevant, because it is no part of my case to say that, in making gas, coal-oil is not produced, but I say that it never has been collected in a separate state as an article of trade; the single instance to which I have referred only making the deviation from the general course;

and saving my friends the trouble of disputing that a certain quantity, though I believe a very inadequate quantity, of what they call coal-oil in a state unfit for use, without undergoing further process, may be taken, is matter of no dispute; but that that which is produced at the gas-works is applicable, and that you could make a garment fit for any gentleman to wear with comfort, I utterly deny. Looking therefore at the extraordinary feature of the case of a patentee not working by his own patent, and looking to the details of the mode of his carrying it on, compared with the simplicity of his patent, it is for you to say whether or not this is new in the sense in which it must be new to sustain the patent. The plaintiff brings his action against the defendant for having made a cloak which consists of the union of two fabrics by means of the solution of India-rubber; but Mr. Mackintosh's patent is for a particular mode, and what evidence is there that the defendants' have used his mode? Upon the evidence what reason is there to suspect that they were in possession of the solution used by the plaintiffs? My learned friend will say, "My witnesses guess this must be made in the same way, because they know of no other." Is that evidence on which to bring an action? The defendant is under no obligation to disclose what is the solution which he uses, and the plaintiffs' evidence is but a loose guess. Mr. Phillips says, "I cannot tell by what means the India-rubber in defendant's cloak was dissolved." I apprehend that it had been dissolved, because I know of no other way in which the same effect could be produced. I deny the validity of the argument that, because we do not shew our mode, you are to presume that it is theirs. There are various ways in which it may be done; it may be done with native juices; but it is clear that the solution of India-rubber to make it applicable to this purpose is a valuable secret which the plaintiff keeps. I apprehend that the specification will be found deficient, his claim being larger than he can support. I should

have been glad to have seen some of the specimens produced by the crude-oil, and to have had some experiments made with materials of a light texture; but all the specimens that have been produced only disprove the specification, that the directions therein contained were the best known to the plaintiff. He never used crude-oil, and never will use it, for it is not in a state to be used, except for the purpose of experiment.

James Stevens sworn. Examined by *Mr. Rotch.*—I am a draper of Bridport. In 1821 I purchased two dozen socks composed of two linings of cloth and India-rubber between them; they were publicly offered for sale.

William Hall sworn. Examined by *Mr. Gurney.*—I am a glover in Wood Street, Cheapside. I had in my shop socks of the description produced by the last witness in 1822; I had small quantities at various times, five, ten, or twelve dozen at a time.

George Green, sen. sworn. Examined by *Mr. Serjeant Talfourd.*—I have been in the habit of making balloons for a great number of years; my first ascent was in 1821. I manufactured miniature balloons before that time. The upper part of a balloon should be flexible. I made it air and water-proof by forming it of a double and treble texture, with a solution of India-rubber. The flexible cement I used was formed entirely of India-rubber, dissolved in oil of turpentine. I used the cement in the seams of the balloon; it was exhibited at the Pantheon. I coated over the surface uniformly, and when the moisture and oil had been sufficiently evaporated, so as to become adhesive, I applied a second coating of the solution in the same way; I then prepared another piece of silk in a similar manner, and united them by pressure. I made balloons from a boy. I believe no person but myself ever succeeded in making a perfect solution with oil of turpentine and India-rubber. Balloons of a small description were publicly exposed for sale in my shop; they were not all made on the same principle.

My large balloon was made without stitching, and with the cement I have described. The seams were united by that cement, but there was another substance in it, in order to prepare the surface to receive it, because it did not adhere so well on a smooth surface as upon that which is not smooth. In 1822, I constructed another balloon on the same principle. The description of pipes I used for the purpose of conveying the gas to the balloon were made of silk or linen. This pipe is an imperfect sample; it was made from the remains of the coronation balloon, which was destroyed at sea, The other fragments I used to cover my shoulders with: I used one large one as a gig cover, and I gave several of them to my friends. I did not tell them the manner in which the cement was made, any further than that it was formed of India-rubber. I did not tell them how I formed it; I always said the varnish I used was India-rubber. I do not varnish now with India-rubber; I still use India-rubber for the purpose of uniting the seams together to the parts where the silk is double. No balloon was ever made cemented together before I made one. I never found my experiments of dissolving India-rubber in spirits of turpentine to fail, except on the first trials; latterly I have found them succeed.

Cross-examined by the *Attorney-General.*—My first ascent was in July, 1821, in a balloon manufactured by means of dissolved India-rubber in the way I have stated; I have no specimens made before 1823, except that pipe. I made double balloons by means of India-rubber. I have not mentioned to any one but my son my mode of doing it. I have explained that it was done with India-rubber; the India-rubber varnish renders a single fold impervious to air, but it is not durable so. I have not got any of the other cement made of India-rubber; I have not had occasion to use it for some time. Gum-mastic and India-rubber dissolved in turpentine is the cement, one for a smooth surface and the other for a

rough one or a varnish. I have applied the compound cement to balloons often, when it has been torn while filling; I employ the compound cement for the seams. Turpentine is a dear article of late, that is why coal-oil has become an article of commerce more than it otherwise would be.

Re-examined by *Mr. Serjeant Talfourd*.—I have not known any thing of coal-oil by that name, till within the last twelve years. The varnish at this time is made of India-rubber, but there are other articles to prevent the action of the coal-gas; I could not get coal-oil without waiting a long time for it, I should have beeu satisfied with three or four pints a week. I have distilled the coal-oil found swimming on the surface of the water in gasometers.

George Green, jun. sworn. Examined by *Mr. Rotch*.—I am son of the last witness. I was acquainted with the solution used by my father in 1820. In making his coronation ballon I assisted in cutting the India-rubber into shreds, the solution was composed of India-rubber and oil of turpentine, and was applied to balloons having a double texture; we applied the cement by means of a brush, and the two surfaces were put together and formed a double substance, and afterwards worked up into balloons. I had a cloak made from the balloon and wore when travelling outside of coaches, when asked of what it was composed I believe I have said it was part of a balloon cemented together by India-rubber. The tube produced was used to convey the gas to the balloon; it was formed of the old materials, and the cement was India-rubber dissolved in oil of turpentine with a portion of gum-mastic.

Cross-examined by *Sir W. Follett*.—When an article has been previously varnished, we were obliged to use the compound cement, because the India-rubber cement having the mastic would not adhere to oiled surfaces, it is too smooth This pipe is made of the compound cement.

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I have always said the India-rubber was dissolved in oil of turpentine; my father always did so too; I never heard him enter particularly into the way of doing it.

Edward Spencer sworn. Examined by *Mr. Gurney.*—I know the witness Green, and also his son, have seen them cement parts of balloons together. In 1822 he told me that the preparation used was India-rubber dissolved in spirits of turpentine; I have seen him dissolve the India-rubber, and assisted him; I had a part of the balloon given me, but have not used it as a cloak. It was water-proof, here is a part; I have had it by me since then to the present time.

Cross-examined by *Mr. Attorney General.*—I have never seen gum-mastic used by Mr. Green. I think I have heard him mention it as a composition used in forming the seams and in repairs. I know what coal-oil is, I have distilled some. I have been at gas works, and all that I have ever seen has been a film so difficult to obtain that I could not get any till a fortnight after I wanted it. I swear that for years I have heard Mr. Green the elder explain to a great number of persons how he made the solution of India-rubber.

John Adams sworn. Examined by *Mr. Rotch.*—Mr. Green gave me a cloak made of the coronation balloon; I wore it for about nine years and it proved air and water tight.

Thomas Hancock, M.D. sworn. Examined by *Mr. Serjeant Talfourd.*—I have been a good deal engaged in botanical researches. I saw waterproof articles exhibited for sale in Demerara in 1812 and 1813. I examined the cloaks and other articles, particularly with a view to ascertain their texture. They appeared to be constructed in the same manner as had been represented to me a year or two before at Rio Para, thus: the milk of the hevea was spread over one piece of cloth, and another texture was laid upon it, and then it was finished; it was dried by being exposed to the sun. It was no secret in Demerara,

the articles were exposed openly for sale; I do not think they were very extensively sold in the colonies, as there was and is a prejudice against them.

The Attorney General replied.—Mr. Mackintosh took out his patent in June, 1823, and immediately commenced manufacturing to a large extent, though not so extensively as within the last few years: first in Glasgow, and afterwards in Manchester. He made large quantities for the government, he had an order for the ordnance office to the amount of 500*l.* in 1824. No one appeared as a rival for more than ten years after the patent was taken out, no one questioned his right to a patent, and no other cloaks possessing the qualities described in his specification were exposed for sale. About twelve months ago, the defendants took up the manufacture of the article under pretence that he had bought some man's patent, and they labelled their cloaks *Fanshawe's improved patent India-rubber waterproof cloth*. There is no such patent as Fanshawe's in existence; this is pure invention. If there is such a patent why is it not produced? My learned friend says, "We do not like to tell you the secret by which we manufacture ours." It is very odd that it should be a secret if it is a patent; I thought my learned friend told us that the conditions on which a patent was granted, was that the patentee should enroll a full and fair disclosure of the nature of his invention for the benefit of the public. They begin their case by stating what is utterly false: they say they have got a patent, which patent does not exist; and if they begin by stating what is false, they will not be very scrupulous with regard to the means which they employ in getting evidence to support a defence that is based upon falsehood. They could call no one to give any account of the manner in which their article is manufactured, because they knew nobody who would not have said that their process was identically the same as that of Mr. Mackintosh's, and therefore they

closed their case without venturing to produce such a witness. I know of no species of property, that if it does exist, ought to be more respected than property in a patent. My learned friend's first objection is, that the invention is not a fit subject for a patent. My answer to that is, that there is no such plea on the record, no such objection in the enumerations of objections to which, under Lord Brougham's act, we are entitled. The invention seems very simple, as all things do when they are discovered. The theory of gravitation itself was discovered by Sir I. Newton, from seeing an apple fall from a tree; and equally simple was the discovery of Mr. Watt with regard to the steam-engine. The only difficulty he had was advancing one step, and I may truly say that that step changed the history of the world; and it was such a step that Mr. Mackintosh took. The process had not been known in this country before, and is therefore a good subject for a patent, and has now become an important article of British commerce, supposing it to be a fit subject for a patent. My learned friend's second objection is, that the specification is insufficient; first, by claiming too much; and secondly, that it does not fairly disclose that which Mr. Mackintosh meant. The words of objection on the record are, "*that coal-oil cannot be produced or made directly in making coal-gas, and that coal-oil is too indefinite.*" My learned friend tried to prove that there was only a thin film ever found floating on the surface of the water in gas-tanks. I have proved that there was produced in a separate state of coal-oil as much as would swim a boat at any time,—that in the metropolis alone there might be obtained from 3000 to 4000 gallons per week; and that coal-oil was well and generally known by that name. If a fair and candid judgment be exercised, it will be found that the specification is framed so that it effectually answers its purpose, describes what is the nature of the invention, claims what is new, and disclaims what had been

previously done. You are, according to the case of King *v.* Arkwright, to take the title and specification together, and not to take one sentence, line, or one word, but to look at it as a whole, and to see what is the fair and just interpretation that ought to be put upon it. The specification does not say any flexible cement, but a "flexible cement *in manner hereinbefore described,*" He claims the application of the cement. The second objection is, that we do not sufficiently describe how the oil is obtained, and how it is to be used. This, gentleman, is no part of our invention; we describe a known solution, because it is the application of that known solution to a variety of fabrics that we claim as our patent. In applying it to tarpaulins it is immaterial whether it smells like otto of roses, or is as offensive as assafœtida. The question is not as to the smell of the article, but whether it is impervious to air or water. In making articles for fine purposes, it is necessary that the oil should undergo purification by distillation, a process known to every tyro. The specification would have been ludicrous if it had described this process. It is not necessary to describe in the specification what is known to all mankind. Our not calling workmen to prove how the solution was made, was because this was not the subject of controversy. It was how the solution was applied, and that has been described by witnesses. But my learned friend says we have departed from our specification, and have therefore wholly upset our patent. I say the specification has been strictly and literally pursued down to the present hour. It is immaterial whether we apply the brush with the hand, or by aid of steam power. If that doctrine of my learned friend were to prevail, there is not a valid patent in existence. There is not a specification filed but some improvements are discovered in working out the invention. And is the patentee to renounce these improvements, or if he avail himself of them is he to be taunted with having departed from his specification, and told that he ought to lose his

property? The only departure we have made is an abridgment of the labour, and a facility in the manner in which the invention is now applied. The test of the specification is, that the article may be made according to the specification, and several witnesses who merely read the specification without deriving information from any other quarter, made the article. It was produced before you, and every specimen was proved to be impervious to air and water. The next plea is that the invention is not new,—that it was publicly known and used before the date of this patent. This point of law was clearly laid down in Lewis *v.* Marline, where it was decided that the use must have been a public use, unless it could be shown affirmatively that the patentee had a knowledge of the subject in an imperfect state from the invention of another person. The patent was for improvements on shearing machines for shearing or cropping woollen and other cloths; and in specifications, among other things, were claimed "the application of a proper substance fixed on a cylinder, to brush the surface of the cloht to be shorn, and also the desired method of shearing cloth across, from list to list, by a rotatory cutter." The brush for this purpose was soon found useless: no machines were ever sold with it; on this ground it was contended that too much had been claimed, and, therefore, the patent was void. The other part claimed, the defendants contended was not new, and proved that a similar machine was in use in New York twenty years ago, and that a specification was sent over to England, in 1811, to one Thompson, residing at Leeds, who employed two engineers to manufacture a machine from it, but this never was finished, in consequence of the disturbances made by the Luddites. The specification was shewn to several persons, but the machine was never brought into use. It appeared also, that in 1816, a model of a machine, to shear cloth from list to list, by means of a rotatory cutter, was brought over from America, by one Smith, and he

shewed it to three or four persons in his manufactory, but no machine was ever made from it, nor was it publicly known to exist, and Smith always used machine manufactured by the patentee. It further appeared that many years ago, one Caxon had made a machine to shear from list to list, which was tried by a person called on behalf of the defendants, but he did not think it answered and soon discontinued the use of it. The defendants contended that this evidence deprived the plaintiffs of the right to a patent, as their invention was not new. Lord Tenterden observed, that as the invention of the machine for shearing from list to list by a rotatory cutter, had not been generally used or known in this country, the patentees might be considered the inventors within the meaning of the statute, 21 James I.; and his lordship left to the jury the questions, whether it had been generally known, and whether the patent had been infringed by the defendants. The jury found for the plaintiffs. An application was made to the court for a new trial, and Mr. Justice Bayley said, if the invention brought from America had been seen by the plaintiff, he could not afterwards have claimed to be the inventor; but if I discover a certain thing, it is no objection to my claim to a patent, that another also has made the discovery, provided I first introduce it into public use.

Here is no ground to doubt that the plaintiff was the inventor of the machine, and first introduced it into public use. There is then the case of Jones *v.* Pearce, where still more decided previous using is proved, but the same was abandoned. Upon the principle of these decisions, I hope this case will be decided. Let us now examine what are the proofs brought to show the invention was not new, at the time of the patent being obtained. There is the sock which has been produced, it is composed of two pieces of linen, with a *solid* piece of India-rubber placed between; this is not the same as our invention; what we claim is the application of the India-rubber in a state of

solution. The witness Green tells you, he used India-rubber dissolved with oil of turpentine, to unite folds of silk, in making his balloons, where it was required to be double; but was it not with the gum mastic cement that he united pieces of silk, for he says he was not aware that India-rubber alone would effect it, and therefore he used a cement made of India-rubber and gum mastic; he says he never disclosed his process to any one. He uses a compound cement, and not the pure India-rubber cement, which is the subject of our patent. Suppose the cement to have been the same, then the publication was not sufficient to invalidate our patent. Suppose the balloon to be exhibited before thousands of spectators, it would have been impossible for them to have discovered whether it was made of one or two folds of silk, or in what manner they were united. The whole evidence of publication is Green's son and the attorney, who contradict what Green himself has sworn. The passage in Humbolt's work proves nothing, even supposing the pure gum was used. My learned friend might just as well say that barley and beer are the same thing, that milk and cheese are the same thing, as to say that the milk from the tree is the same as dissolved India-rubber; but all these were experiments, they failed in consequence of the offensive smell. In Johnson's patent there is no joining of two fabrics by dissolved India-rubber, on the contrary, a coat of India-rubber is applied to a single fabric, and the India-rubber covered with flock or dust of cloth, sifted over; and although in Mr. Mackintosh's patent, the oil is recommended to be pure, it is not necessary for all purposes where the smell would not be objectionable. Under all the circumstances, I confidently expect your verdict. If you decide the patent is good, there is no doubt of the infringement.

His lordship commenced summing up, when the jury intimated that they were satisfied, and found for the plaintiffs.

NOTICE OF EXPIRED PATENTS.

(*Continued from p.* 329.)

Augustus Applegath, of Duke Street, Leit's Town, Lambeth, Surrey, Printer, for certain improvements in printing-machines.—Sealed January 14, 1822.

John Hague, of Great Pearl Street, Spitalfields, Middlesex, Engineer, for a method of making metallic pipes, tubes, or cylinders, by the application and arrangement in the apparatus of certain machinery and mechanical powers.—Sealed January 29, 1822.

Sir William Congreve, of Cecil Street, Strand, Middlesex, Baronet, for certain improved methods of multiplying fac-simile impressions to any extent.—Sealed January 29, 1822.

Peter Ewart, of Manchester, Lancashire, Civil Engineer, for a new method of making coffer-dams.—Sealed January 29, 1822.—(*For copy of specification see Repertory, Vol.* 43, *second series, p.* 193.)

Robert Bill, of Newman Street, Saint Mary-le-Bone, Middlesex, Gentleman, for an improved method of manufacturing metallic tubes, cylinders, cones, or of other forms, adapted to the construction, and for the construction, of the masts, yards, booms, bowsprits, or casks, or for any other purposes to which they may be applicable.—Sealed February 5, 1822.

Frederick Lewis Tatton, of New Bond Street, Middlesex, Watchmaker, for an astronomical instrument or watch, by which the time of the day, the progress of the celestial bodies, as well as carriages, horses, or other animals, may be correctly ascertained. Partly communicated by a foreigner residing abroad.—Sealed February 9, 1822.

George Halworthy Palmer, of the Royal Mint, Engineer, for certain improvements in the production of heat, by the application of well known principles not hitherto made use of in the construction of furnaces of steam-engines and of air-furnaces in general, whereby a considerable saving in the expenditure of fuel is obtained, and the total consumption of smoke may be effected.—Sealed February 12, 1822.

John Frederick Smith, of Dunston Hall, Chesterfield, Derbyshire, Esquire, for improvements in dressing of piece goods made from silk or worsted, or of both these materials.—Sealed February 12, 1822.

Sampson Davis, of Upper East Smithfield, Middlesex, Gun-lock maker; for an improvement upon the lock for guns and other fire-

arms, which enables the same lock to be used upon the percussion principle, or with gunpowder, without charging the lock or hammer. Sealed February 12, 1822.—(*For copy of specification see Repertory, Vol.* 43, *second series, p.* 68.)

Thomas Brunton, of the Commercial Road, Middlesex, Chain-Cable and Anchor Manufacturer, for an improvement or improvements upon the anchor.—Sealed February 12, 1822.

Elisha Peck, of Liverpool, Lancashire, Merchant, for certain machinery to be worked by water applicable to the moving of mills, and other machinery, of various descriptions, or for forcing or pumping water. Communicated to him by Ralph Bulkley, a foreigner resident in the city of New York, and a Citizen of the United States.—Sealed February 22, 1822.

William Erskine Cochrane, Esq., of Somerset Street, Portman Square, Middlesex, for certain improvements in the construction of lamps, whereby they are rendered capable of burning concrete oils, animal fat, and other similar inflammable substances.—February 23, 1822.

William Buckle, of Mark Lane, London, Merchant, for certain improvements in machinery for shaping or cutting out irregular forms in wood, or any other materials or substances which admit of being cut by cutters or tools revolving with a circular motion, whether such motion be continuous or reciprocating. Communicated to him by John Parker Boyd, of Boston, in America.—Sealed March 2, 1822.

John Lane Higgins, of Fulham, Middlesex, Esquire, for certain improvements upon the construction of carriages.—Sealed March 2, 1822.—(*For copy of specification, see Repertory, Vol.* 44, *second series, p.* 68.)

Charles Yardley, of Camberwell, Surrey, Glue Manufacturer for a method of manufacturing glue from bones, by means of steam. —Sealed March 2, 1822.

John Thompson, of Regent Street, Westminster, and of the London Steel Works, for a certain improvement in the method of forming or preparing steel for the manufacture of springs for carriages, but principally applicable to all those usually denominated coach-springs. —Sealed March 2, 1822.—(*For copy of specification see Repertory, Vol.*41, *second series, p.* 193.)

John Ruthven, of Edinburgh, Printer, for a new method of procuring a mechanical power.—Sealed March 2, 1822.

LIST OF NEW PATENTS.

Jeremiah Crook, of Liverpool, in the county of Lancaster, Merchant, for certain improvements in the machinery for manufacturing hat bodies. Communicated by a foreigner residing abroad.—Sealed October 28, 1836. —(*Six months.*)

Thomas Edge, of Great Peter Street, in the city of Westminster, Gas Apparatus and Lamp Manufacturer, for certain improvements in lighting or illuminating by gas, oil, or spirit lights or lamps. Communicated by a foreigner residing abroad.—Sealed October 28, 1836.— (*Six months.*)

Robert Copland, of Courlands, Wandsworth Road, in the county of Surrey, Esquire, for improvements upon patents already obtained by him, for combinations of apparatus for gaining power.—Sealed November 5, 1836.— (*Six months.*)

James Elnathan Smith, of Liverpool, in the county of Lancaster, Merchant, for improvements in railways and on locomotive carriages to work on such railways. Communicated by a foreigner residing abroad.—Sealed November 8, 1836.—(*Six months.*)

John Whitcher, of Ringwood, in the county of Hants, Carrier, for improvements in drags, or apparatus applicable to carriages.—Sealed November 8, 1836.—(*Six months.*)

James Smith, the younger, and Francis Smith, both of Radford, in the county of Nottingham, Mechanics, for certain improvements in certain machinery already known for making bobbin net or twist lace.—Sealed November 8, 1836.—(*Six months.*)

Joel Livsey, of Bury, in the county of Lancaster, Cotton Spinner, for improvements in machinery used for spinning, preparing, and doubling cotton and other fibrous substances.—Sealed November 10, 1836.—(*Six months.*)

Bertie Paterson, of Peacock Street, in the parish of Saint Mary Newington, in the county of Surrey, Engineer, for certain improvements in the construction of meters or apparatus for measuring gas or liquids.—Sealed November 12, 1836.—(*Six months.*)

Henry Augustus Wells, of the city of New York, but now residing in Threadneedle Street, in the city of London, for certain improvements in the manufacture of hats.—Sealed November 15, 1836.—(*Two months.*)

Fletcher Woolley, of York Street East, Commercial Road, in the county of Middlesex, Gentleman, for improvements in the manufacture or preparation of materials to be used as a substitute for bees wax, parts of which improvements are applicable to other purposes. —Sealed November 15, 1836.—(*Six months.*)

John Yule, of Sauchiehall Street, Glasgow, Practical Engineer, for improvements in rotatory engines, or an improved rotatory engine.—Sealed November 15, 1836.—(*Six months.*)

Augustus Applegath, of Crayford, in the county of Kent, Calico Printer, for certain improvements in printing calico and other fabrics.—Sealed November 15, 1836. —(*Six months.*)

Joseph Whitworth, of Manchester, in the county Palatine of Lancaster, Engineer, for certain improvements in machinery for spinning and doubling cotton, wool, and other fibrous substances.—Sealed November 19, 1836.—(*Six months.*)

William Norris, of Alston, in the county of Cumberland, Land Surveyor, for certain improvements in the manufacture of combs. Communicated by a foreigner residing abroad.—Sealed November 19, 1836.—(*Six months.*)

John Gordon Campbell, of the city of Glasgow, in the county of Lanark, Merchant, and John Gibson, of the same city and county, Throwster, for a new or improved process or manufacture of silk, and silk in com-

bination with certain other fibrous substances.—Sealed November 19, 1836.—(*Six months.*)

John Buchanan, of Ramsbottom, in the county of Lancaster, Millwright, for an improved apparatus for the purpose of dyeing and performing similar operations.—Sealed November 22, 1836.—(*Six months.*)

Thomas Robson, of Park Road, Dalston, in the county of Middlesex, Operative Chemist, for improvements in firing signal and other lights.—Sealed November 22, 1836.—(*Six months.*)

George Gwynne, of Holborn, Gentleman, and James Young, Brewer, of Brick Lane, both in the county of Middlesex, for improvements in the manufacture of sugars.—Sealed November 22, 1836.—(*Six months.*)

Isaac Naylor, of Stainbrough, near Barnsley, in the county of York, Gamekeeper, for an alarm gun, or reporter and detector.—Sealed November 22, 1836.—(*Two months.*)

Timothy Hackworth, of New Shildon, near Bishop Auckland, Engineer, for improvements in steam engines.—Sealed November 22, 1836.—(*Six months.*)

Thomas Ellis, of Stamford Hill, in the county of Middlesex, Esquire, and Thomas Burr, of Shrewsbury, in the county of Shropshire, for improvements in the manufacture of sheets and pipes, or tubes, and other articles of lead and other metal.—Sealed November 24, 1836.—(*Six months.*)

Joseph Woollams, of Wells, in the county of Somerset, Gentleman, for certain improved means of obtaining power and other motion from known sources.—Sealed November 24, 1836.—(*Six months.*)

LITERARY NOTICE.

The Transactions of the Institute of British Architects, 4to., Plates, are just published.

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TO

VOL. VI. NEW SERIES.

END OF THE SIXTH VOLUME.

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